The Builder.

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A Manual of Public Health.

THE book published under this title by Dr. Winter Blyth is a very important one of its class, covering a very large field.* It aims at giving an outline,—for only an outline of such a great subject can be given in one volume,—of the conditions of the maintenance of public health. How extensive is the ground it covers will be at once recognised on a mere enumeration of the headings of the twelve main sections into which it is divided, and which are as follows:—1. Statistics. 2. Air—Ventilation—Warming. 3. Meteorology. 4. Water Supply. 5. Drains — Sewers — Sewer Disposal. 6. Nuisances. 7. Disinfection. 8. Zymotic Diseases. 9. Isolation Hospitals. 10. Food—Diet. 11. The Duties of Sanitary Officers. 12. Inspection of Food.

Thus it is at once a medical and a sanitary treatise, the key to the object and plan of the work being given in the words of the preface; "it is intended to convey the author's idea of the subjects of special knowledge necessary for those engaged in either an administrative or subordinate capacity in the Public Health Service to be acquainted with." No one could be better fitted than Dr. Blyth, by acquirements and experience, to give such an outline of the subject of Public Health considered from the administrative point of view. In regard to the sanitary questions with which we are more directly concerned we do not gather that the author professes to furnish any new lights, but rather to tabulate the systems which may be employed, and give his opinion as to the degree in which they subserve the great object which he has in view, the maintenance of public health at the highest average possible under present circumstances. It is with this limitation that all such efforts must be considered; for it will be many years, or rather many generations, before even the best sanitated society can arrive at the point at which finality can be believed to have been reached; a conclusion which should be rather encouraging than the reverse. During the last quarter of a century we have got, we may be justified in thinking, fairly on the right road towards increasing the healthfulness and duration of human life; the progress made in that period seems, comparatively speaking, immense; yet it may be that in reality we are but at the commencement of the fight against the causes which tend to encourage or produce disease and to shorten life, and that far greater progress than we have even dreamed of in that direction may be in store for future generations. In the meantime, every book such as this, by an energetic and practical worker in the cause, tends to help it forward.

Into the more purely medical sections of the book it is not our part to go; we can only say that we believe no one who is concerned with the subject of Public Health will do wrong in giving attention to Dr. Blyth's suggestions, whether or no they are such as all other members of his profession will concur in. But it is of interest to note the opinions of a medical man on those sanitary operations which in their details are the more special province of the engineer.

In regard to the principal sources of water supply, rivers, wells, and lakes or artificially-formed reservoirs, we observe that the author expresses no decided opinion as to any general preference to be given to any one of these classes of supply from a medical point of view, beyond the remark that a stream is very rarely pure enough to be used directly. In regard to his remark that "in the majority of instances a water-supply from a river can be led into a storage reservoir by gravitation alone, provided the intake is placed high enough up the river," it must be remembered, and should have been pointed out, that where a large supply is required, this involves the loss of all the watershed of the river below the point of intake—in fact impounds a very small proportion of the flood waters, so that it is hardly applicable where it is an object to utilise the river to the utmost that can be done without unduly robbing it as a river. The author sums up in favour of constant supply to houses, a conclusion from which few will differ. The minimum desirable quantity of "thirty gallons a day per head of population," for this climate, will probably have to be considered as too low before long, as the daily use of large baths increases, as it is pretty certain to do.

Dr. Blyth's table of consumption per head of population for a number of cities is of interest. London, with its 31·25 gallons, stands well among European cities, but American cities are far more sumptuous in their water supply; Chicago registering 102·5 gallons, New York 60·9, Washington 143·0, Ottawa 192·5, San Francisco 64·5, Philadelphia 54·15. It is not quite clear whether these are quantities consumed, or quantities estimated and provided for; but in either case water supply is far more liberal in the United States and Canada than in England. Bombay stands at 20·0; Calcutta at 2·2 per head is probably a misprint.†

In regard to drainage we observe that the author adheres to the recently accepted rule that the house drain should be cut off from the sewer by a syphon or disconnecting chamber; but he records the opinion that the traps to the mouths of the house drains should be regarded as belonging to the local authority and be liable to official inspection. There may be difficulties in the way of this, but we concur in thinking that it would be highly desirable that it should be so, considering the ignorance and indifference of so many private owners in regard to drainage. It is rather out of date to say that "water-seal traps of approved form may be considered as perfect barriers to sewer-gas"; they are, when properly constructed and ventilated, very efficient practical checks, but hardly to be called "perfect" in that respect.

The whole of the chapters on drainage consist in the main of a brief recapitulation of existing methods, which is perhaps all that the scope of the book demands; the present drainage system of London is described in a separate chapter and illustrated by a map. In the chapter on water-closets the author draws attention to the unhealthy effect of the old system of boxing up water-closet seats in casings, within which "the whole space is not unfrequently a receptacle of dirt and filth and a cause of air contamination." We have commented strongly on this, and also on the similar system of casing up baths; the objections are less in the latter case, but in both there is a dark, boxed-up

* A Manual of Public Health. By A. Winter Blyth, M.R.C.S., L.S.A. London: Macmillan & Co., 1891.

space, which is never cleansed nor swept. In describing the system of water-waste preventing cisterns, we are surprised that Dr. Blyth should give, without a word of comment, the statement that such cisterns "generally hold a charge of two gallons;" they do, but this is far too little, and even if it be effectual in cleaning out a well-designed pan, where the most is made of the flush of water, it is too little for carriage to the sewers; economy of water in this way is a danger to the health of towns, and a larger cistern ought to be compulsory in the official by-laws. Water companies have no right to interfere with efficient drainage for the purpose of saving water; the remedy is worse than the disease.

Into the subject of ventilation the author goes much more fully. Among the special principles laid down we are glad to see that he recognises that the top of an apartment is not the place to admit fresh air, but preferably a few feet above the floor. When air is warmed in entering, even a lower point than this may be advisable. In speaking of means of extraction of air, Dr. Blyth is unquestionably right in his opinion that the influence of cowls has been much over-rated. The fact is, they depend on wind for their action, and when the air is still they are less efficacious than an open tube. Of course this entire stillness of the external air is not a very frequent condition, but it should be recognised as a condition which has to be dealt with. On days of typical London fog, when the air is still and laden with impurities, we have known it actually pouring down chimneys provided with what are supposed to be extraction cowls. We are entirely with the author also in the opinion that for large public buildings, such as schools, assembly-rooms, theatres, &c., mechanical ventilation is the only kind of ventilation that can be relied on. We presume the author has an adequate basis of observations for the important statement which he gives in regard to this subject, that "in schools badly ventilated on the natural system, the micro-organisms increase up to a certain point with increase of floor and wall space, whereas in mechanically ventilated schools where the air is quickly renewed, the micro-organisms decrease with increase in cubic space." The following table of statistics on this subject is given:—

Cubic Space per Person.	Naturally Ventilated.				Mechanically Ventilated.			
	No. of Cases.	Carbonic Acid.	Organic Matter.	Total Micro-Organisms.	No. of Cases.	Carbonic Acid.	Organic Matter.	Total Micro-Organisms.
Cubic Feet.								
50—100	6	21·5	16·2	119	..	..	..	..
100—150	14	15·5	19·6	128	7	14·0	7·8	23
150—200	5	18·9	12·3	150	8	11·4	9·6	14
200—250	9	21·1	16·8	188	5	11·8	12·3	10
250—300	4	17·1	9·5	187	..	..	..	..
300 and upwards	4	15·1	11·8	12	6	13·0	3·7	2

The comparative cost per head for the two systems is given, as the result of observations on schools in Dundee, as being, for a school of 1,000 children, 2¾d. per head for natural ventilation, and 7½d. per head for mechanical ventilation. "The cost will be greater in towns where coal is dearer, less where coal is cheaper than in Dundee. But in any case £20 to £25 per year per 1,000 children should be considered well spent if it conduce to greater purity of air;" a conclusion which we fear some promoters of schools are still unwilling to adopt, but public opinion must inevitably force it on all before long; or if not, legislation ought to intervene. One suggestion is made in this chapter which deserves more consideration, viz.: as to the value and comfort of double windows in cold weather. The layer of air between the two gets to some extent warmed; whereas in buildings with large windows, such as churches, schools, and some other classes must necessarily have, the expanse of glass becomes a refrigerating surface chilling the internal air of the room perceptibly in its neighbourhood.

The long chapter on "Nuisances" is an exceedingly useful one, giving a description of the various trades from which nuisances dangerous to health arise, the special part of the process, or the special materials employed, which are injurious, and in the majority of cases suggestions for minimising these evils. The list is a longer and more formidable one than many persons not officially concerned with abating nuisances are aware of. "Gut-scraping" appears to be one of the very worst, at least to those concerned in it; so much so that official inspectors, who may be supposed to be tolerably hardened, have found difficulty sometimes in going through their duties, though its effects are not so multifarious or so much calculated to produce public nuisance as, for example, the business of slaughter-houses. On this head the author expresses the hope that the time is not far distant when private slaughter-houses in large population centres will be abolished. "The public health cannot be protected, nor the sale of diseased animals controlled, except in abattoirs." Among other trades classed among the nuisances are soap-boiling, tanning, glue-making, india-rubber manufacture, gas-making, manufacture of pyroligneous acid from wood; manufacture of alkali, sulphate of ammonia, sulphuric acid, glass, tin-plate working, Portland cement, &c., &c. The fumes from calcination are the offensive part of the latter manufacture; glass works also produce acid emanations; tinplate also, from the "pickling" of the plates in acid. Of one trade specially connected with building, namely brick-burning, Dr. Blyth speaks very strongly, at least in regard to the process known as "clamp-burning." As the subject has been a good deal under notice of late, it is worth while to quote his opinion on this head:—

"Clamp burning is especially offensive. The emanations are watery vapour, thick smoke, the usual gases of combustion, very often sulphuretted hydrogen, and certain pyroligneous matters which have an offensive odour. Where, as is often the case, household refuse is used containing animal and other organic matter, the odour is intensely disagreeable. The emanations are often acid, irritating to the mucous membranes, and injurious to vegetation.

The fumes from burning bricks differ in composition very much in the different stages of the process, the clay used, and the fuel employed. Clamp burning, as the most offensive process, *should be entirely prohibited in the neighbourhood of large towns.* Kiln burning by careful stoking, by the use of certain special kilns, and by the aid of a long chimney shaft, can be carried on with but trifling offence."

The italics are ours. It will be remembered that not long since the offensive smells complained of as infecting a large area of London in the Paddington and Marylebone district were attributed to brickfields outside this quarter of London.

In regard to stables in towns Dr. Blyth thinks there is much to be done in the way of improvement as regards their effect on the health of persons in their neighbourhood. The effect of ill-built and ill-ventilated stables on the animals themselves is not, of course, within the limits of his subject, or we imagine he would have something to say on that point also. But he observes that the keeping of stables and mews in order is a daily care to the sanitary authorities of large towns, more especially when the floor above is used as a habitation (as is the case in most of the London mews):

"In the metropolis there are many thousands of persons living over stables and constantly breathing an atmosphere impregnated with ammonia. There were no reliable statistics on the subject, but such conditions cannot be conducive to high vigorous health. Stables should of course have a perfectly impervious floor, and the drains should be well laid and of good materials. There should also be no difficulty in making the floors of the living rooms above stables of impervious material, and I think a sanitary authority would be justified, on complaint of nuisance owing to stable emanations rising through a pervious floor, in giving notice to remedy the nuisance."

This stable question is a serious matter for London, where large stables in the heart of thickly-inhabited quarters are an absolute necessity; and considering how little room there is to spare for them, and how seldom any opportunity can occur for extending the confines of a mews once built and its limits defined, it seems almost unavoidable that the grooms and stable-men's habitations should be over the stables, economy of space compelling it. There cannot be a question that in all such cases there should be a concrete or other species of impervious floor over the stables, and it is to be wished that Dr. Blyth's hint should be acted upon. It must be admitted, however, that the requirement to alter this unfit condition of human habitation may be a more serious thing for the landlord than the author perhaps realises; as in some cases at least it would mean rebuilding the whole block, in cases where the existing walls were not fitted to carry any but a light wooden floor.

The greater portion of the remainder of the volume is occupied with the consideration of purely medical subjects. There is a short chapter, however, on the principles of construction of Isolation Hospitals. We may note in regard to this subject that the author specially records that in his opinion wards should always be constructed with solid walls of stone, brick, or concrete; "corrugated iron hospitals lined with matchwood, and wooden huts, have all been failures as regards temperature and comfort." It is important to note this as a medical opinion in regard to a form of hospital building which has been considered in many quarters satisfactory, at all events to meet an unexpected demand. Two plans of small isolation hospitals which are given as model plans recommended by the Asylums Board, are defective in several points, and admitted to be so by the author; why not then have given a better one?

The standard set up by Dr. Blyth in regard to "duties of Health Officers" is high enough, higher perhaps than is generally attained to, though on the whole we believe there are few professions in which a more conscientious spirit is brought to the work in hand. "The Medical Officer of Health," says the author, "should aim at the high ideal of endeavouring to collect in his office details as to the drainage, water-supply, construction, tenancy, and disease history of every single house in his district. The information should be contained in indexed books, so that at any time he can in a few minutes give the whole sanitary history of a house." This is a splendid ideal, especially in view of the fact that, as Dr. Blyth suggests, people intending to take up residence in a house could in that case apply at the Health Office and get information which they can now only obtain by inquiries in several quarters. Query: can they in many cases obtain it at all?

On the purely medical portion of the book, as observed, we cannot enter here, but much of the information contained in it, and which we may pretty safely assume to be sound, is of great value in regard to the best means of guarding against the dangers to health almost inseparable from the conditions of life in crowded cities; and on this ground the book is well worth the attention of the general public, as well as of the class for whom it was specially written. It appears opportunely, too, in the early part of a year in which public attention is to be especially directed to the subject of public health on the occasion of the International Congress of Hygiene to be held in London in August.

GOOD FRIDAY WEEK.—Next week we go to press a day earlier than usual. All communications for the Editor should reach him *by first post on Wednesday morning;* but lists of Tenders will be received up to 12 noon of the same day.

OLD COTTAGE ARCHITECTURE. — Mr. Ralph Nevill, whose previous work on "Old Cottage and Domestic Architecture in Surrey," has been noticed in our columns, is bringing out a second edition of this work, as well as a new volume on the Old Cottage and Domestic Architecture of Gloucestershire. The principal portion of both works has appeared in our pages in the first instance.

AGENTS' COMMISSIONS.

THERE is probably no business point upon which there is greater laxity and want of moral strength than in regard to the taking of commissions by agents. The thing is done with such ease, the results are often so remunerative, that good intentions may frequently be overcome. Moreover, there is so much money made every day by what may be called illegitimate commissions that the impropriety of receiving commissions is often scarcely recognised. But the broad, clear principle is that an agent must not receive commissions from third persons for simply doing his duty; and if he does receive them, they belong to his principal. The principle has recently been re-enunciated by Mr. Justice Kekewich in a passage which is worth consideration by all business men. True, he had to apply it to dealings with a ship, but it is as applicable to a house as to a vessel; indeed, as we shall see, it is applied by the Judge by way of example to the case of an estate agent. "A paid agent," he said, "I am not now concerned with an unpaid agent, is bound to discharge all those duties, multifarious or otherwise, and onerous or otherwise, which the terms of that agency cover. He must make his own bargain with his principal, and it is his duty to do all that that bargain entails and to be content with his remuneration. If he is called on to do anything outside the terms of his agency, he is entitled to make a special bargain, or he can decline to do it unless he is remunerated on a special footing; or he may do the work, and, provided everything is fair and above board, he probably would be allowed some fair remuneration according to some recognised measure of the value. But if he does anything within the terms of his agency, however uncompensated it may appear to him personally, he can neither charge for it in his account, nor can he secretly take any commission for it. Take such a case as that of an estate agent: if the landlord requires him to see after the building of a cottage, which involves the purchase of timber, it would be the duty of that agent to purchase the timber on the best possible terms, and if he happens to be a timber merchant he cannot supply the timber at a profit. If he deals with another timber merchant, who is disposed to give him a commission for the introduction of the business, he must either decline that commission, or, if he accepts it, must give his employer the benefit of it." These observations are worthy of note, more especially by those who are at the beginning of a business career. Let us apply them to other cases. If an architect is offered a commission by a manufacturer he must either decline it or "give his employer the benefit of it." If a builder employs a solicitor to procure a sum of money on loan for him, the payment for the work being either a fixed sum or a percentage on the amount of the loan, that solicitor is not entitled to take any commission from the lender; if he does, it ought to be handed over to the borrower. Again, it is equally clear that if a builder is employed to do work for which he has to obtain certain articles, such as stoves or ranges, he has no business to charge the employer a nominal sum and take the trade discount for himself. It would be allowable and proper to charge a sum for the labour or skill of selection; but, as is so often done, to charge an employer a particular sum for an article and to receive from the manufacturer a commission or discount, is clearly not allowable according to the principle enunciated by Mr. Justice Kekewich. But it is a matter of common knowledge that comparatively upright men receive all sorts of illegitimate commissions which have become so common that it is forgotten that it is illegal to keep them. It may be feared, indeed, that the practice has become in many quarters so common that it will never be eradicated. From time to time it receives the condemnation of the Bench, and commissions have to be disgorged. But the young practitioner or man of business cannot too constantly bear in mind the principle which has been stated above, and which, if he remembers it, will make him throughout his life a thoroughly trustworthy man of business. There is, however, one part of Mr. Justice Kekewich's judgment which can scarcely be regarded as correct, the fact being that it really does not convey what appears to have been the Judge's meaning. Speaking of an agent being also a timber merchant, he says, "he cannot supply the timber at a profit." This is not true; the agent, if he is also engaged in trade of another kind, cannot charge for his personal time occupied in buying—selling, so to say, from or for himself to himself—for his employer. Nor may he make any illegitimate profit, but he is entitled to sell his articles to himself for his employer at a fair market rate, such as will give him a fair business profit on the sale. Take the case of a "sanitary engineer" engaged by a householder, the former being also the owner and maker of a patented trap. It would be perfectly fair for him to supply the article at the ordinary market rate, which will give him a profit on the manufacture. If the whole of the judgment of Mr. Justice Kekewich is perused, clearly this is what he means, though the actual sentence above quoted would seem to imply the reverse. The judgment is so valuable, and worthy of perusal from a practical point of view, that it is to be regretted that this slip of verbal expression should have appeared in it.

NOTES.

SIR JOSEPH BAZALGETTE, concerning whose work some particulars are given on another page, was a great engineer who had the good fortune, which does not happen to all gifted engineers, to have great opportunities set before him. It does not often happen to one man to have to carry out two such immense and important works as the embankment of the Thames and the drainage of London. The latter operation, unhappily, has not proved to have the character of finality which some sanguine persons expected of it. As far as turning the sewage into the Thames went, it was an immense mistake; but it was a mistake which took us one step at all events, and that an important one; it took pollution from the subsoil of the city and relegated it to the river. The work of the present generation is to get it out of the river. The Thames Embankment is a truly great and monumental engineering work; it might have been still finer in result if engineers would either study architecture or take the advice of those who do. It is marred to some extent by bad masonic detail, and by the absurd and meaningless arched erections put up here and there, apparently from some vague notion of "effect," and without any obvious motive. However, engineers are born without a sense of these things, and it cannot be helped. At the meeting of the Institution of Civil Engineers on Tuesday last, Sir John Coode, while all the meeting remained standing, delivered a few feeling words in regard to the death of their distinguished colleague, to whose professional genius he paid the highest tribute, while in regard to Sir J. Bazalgette's character it could not be better summed up, he thought, than in two words—he was a "Christian gentleman."

WE have received a copy of a proclamation of the President of the United States which has been already published in some of the daily papers, giving official notice of the opening of the Chicago Exhibition on May 1, 1893, in memory of the four-hundredth anniversary of the discovery of America by Columbus. The document concludes with the following appeal:—

"And in the name of the Government and of the people of the United States, I do hereby invite all the nations of the earth to take part in the commemoration of an event that is pre-eminent in human history, and of lasting interest to mankind, by appointing representatives thereto, and sending such exhibits to the World's Columbian Exposition as will most fitly and fully illustrate their resources, their industries, and their progress in civilisation."

There is a little of the spread-eagle about this, perhaps; but it seems to indicate that the United States Government is in earnest in the intention to make a great success of the exhibition.

WE give in another column a summary of the main portion of the report of Sir B. Baker and Mr. Binnie on the subject of the main drainage of London, accompanied by a reduced and simplified copy of the second plan accompanying the report, and which shows the two proposals for future operations, either in taking the outfall further down the river to the Sea Reach estuary, or taking the main outfall sewer away to the Maplin Sands. These are only proposed as ultimate, not immediate operations. There is another point illustrated by this map, however, which is of some immediate importance. The report recommends the continuance and further development, for the present, of the shipment of sewage out to sea, and mentions "Barrow Deep" as the site of deposit, which is said to be "practically the open sea." The exact force of "practically" here we do not understand. What is evident is that Barrow Deep is a channel between two banks, varying from one mile to two and a half miles in width, and that it is twelve to fourteen miles from the coast line on which are Herne Bay, Westgate, and Margate. Perhaps any contamination of the sea-water at that distance is hardly likely, but it does not seem to be quite impossible; and at all events the question does occur, how many years will Barrow Deep remain Barrow "Deep" with this immense amount of matter annually sunk in it? There is also to be taken into account the fact that The Barrows, the banks north of the "deep," are uncovered at low tide, and must catch a good deal of the sewage matter, which will not improve the purity of the east winds blowing up the Thames Valley. On the whole it appears to us that the delivery point for the sewage vessels should be further out, in what is really as well as "practically" open sea.

THE London Sky-signs Bill has passed the House of Commons Committee, and it is to be hoped will become law before very long, although its practical effect on existing sky-signs cannot come into operation till six years after the passing of the Act. Mr. A. T. Walmisley, civil engineer, was called as the scientific witness on behalf of the London County Council, and it may be of interest to note here some of the practical objections against sky-signs given in his evidence. A sky-sign of less height than half the width of the base would, he said, be useless as an advertisement, and a sky-sign of greater height than the base would be dangerous because the bracing wires attached to anchor the top of the vertical frame would be at too acute an angle with it to act sufficiently in resisting strain. In many of the existing sky-signs the height actually does exceed the base. A wire breaks without notice, whereas a wall generally shows signs of being in a dangerous state before it actually falls. It would be possible, Mr. Walmisley thought, to make a sky-sign safe over a new building where piers were built up purposely to secure it, but in the case of nearly all the London sky-signs the structure already exists, and is not calculated to bear this extra strain nor the lifting action of the wind-braces on the eye-bolts driven in to hold them. Before the existing specimens cease to be sky-signs and become old materials,—they will, however, have a fair chance of doing damage. Periodical inspections are much better than none; but in the interval between two inspections a maleficent sky-sign might distinguish itself, and justify legislators, by some noteworthy exploit. A guy loosened in mischief, or by further decay of

inferior brickwork, a perishing bolt, or the giving way of a frail roof used in guilelessness for supporting a sign of spirited trading,—these and other similar trifles would be sufficient provocation. Repairs and the renewal of protective coatings should not be optional, but enforced, and their execution certified as well as the general security of the structures.

AN attempt on the part of Mr. J. Thornhill Harrison, M.Inst.C.E., to revive at a recent meeting of the Institution of Civil Engineers the idea that London could be adequately supplied with water in the future from the chalk formation of the upper Thames, without unduly robbing the river, led to an important discussion on the two succeeding evenings, in which a number of eminent engineers took part, the result of which may be said to be a body of expert evidence which rebuts for ever the idea that this source can be looked to for an adequate London water supply. In fact the proceedings could hardly be called a discussion, the reader of the paper being on one side, and every one else against him. As one speaker very pointedly said, the reader of the paper seemed to have forgotten that you cannot pump water from the bottom of a cistern without affecting the top level. How much the "top level" may be affected in the case of the chalk might be gathered from an account given by Mr. Mansergh, as to two wells pumping two million gallons daily, which in four or five years lowered the level of the water in the chalk stratum in which they were sunk to the extent of 14 ft. The most extraordinary statement in Mr. Harrison's paper was that the Thames has a daily increment of about 440,000,000 gallons between Teddington and Kew; a theory which appeared to be absolutely without statistical support. The paper has, however, given rise to a valuable and interesting discussion, which has in all probability disposed of the subject finally.

BŒOTIA is just now yielding rich treasures to the student of Greek ceramography, treasures, too, of no small importance to the mythologist. We drew attention two years ago to the local pottery found in the Kabeiroi sanctuary near Thebes, and which, owing to the learning and ingenuity of Dr. Otto Kern, threw much light on the relation between those mysterious divinities, the Kabeiroi, and those other mysteries of Orpheus. It is again Dr. Kern who in the last number of the Ἐφήμερις Ἀρχαιολογική comes forward to publish and elucidate a very remarkable Krater found in Bœotia, and now in the Polytechnic Museum. Up to the finding of this vase, probably few students of Greek ceramography would have hesitated to say that the God of Healing, Asklepios, was never depicted on vase-paintings. A feeling also existed that he was not likely to appear. The same also would have been said, with perhaps even more conviction, of the Goddess Hygieia. True though the generalization may still remain for Athenian ware, we have now a fine instance of both God and Goddess on Bœotian pottery, and it is to these *local* productions, that, less influenced as they naturally are by literary tradition, we have to look for additions to our knowledge of local mythology. On the obverse of the vase, Asklepios reclines on a couch, near which is a table spread as in the "funeral banquet" reliefs, now so familiar. His right hand holds a Kantharos, out of which a huge coiled serpent is drinking; his left hand holds an egg, the serpent's favourite food. On the reverse, a maiden brings offerings on a tray to a seated goddess who holds sceptre and phial. Above, suspended on the wall, are votive offerings of a hand and two legs, this settles the question of the cycle to which the seated figure belongs, she must be a healing goddess. Healing divinities, male and female, we are accustomed to call Asklepios and Hygieia, but Dr. Otto Kern is too well-furnished a mythologist to dogmatise on the precise attribution. Scattered about Thessaly, Bœotia, and the Peloponnese, were many a "healing" pair of under-world divinities, who finally succumbed to the dominant God. Of the interest of the one in connection with the large class of "funeral banquet reliefs," space will not allow us to speak. It seems a pity that the Ἐφήμερις should oblige Dr. Kern to have his paper *translated into* modern Greek, and thereby rendered inaccessible to many archæologists.

AT the first monthly meeting of the Vereinigung Berliner Architekten, which society has the management of the architectural division of the coming Berlin International Art Exhibition, some business referring to non-German exhibitors was gone through and several letters from the presidents of non-German architectural societies specially invited to take part in the Exhibition were publicly read. Among these letters two written by M. Charles Garnier, as President of the Société Centrale des Architectes français, were of interest, especially the latter of these two, written on February 27, but two days after the first one, in which the German invitation had been very politely accepted. This second letter was as follows:—

„Paris, le 27. Fev. 91.

Monsieur et honoré confrère.

Vous avez dû recevoir la lettre que je vous ai adressée en réponse à votre communication et vous avez vu que notre Soc.été devait se tenir dans une grande réserve: Mais depuis ce moment il s'est produit une sorte de crise qui va vendre bien difficile la participation des artistes à votre exposition.—Vous le savez. Je n'ai pas à juger les motifs qui font agir les uns ou les autres, ni à me prononcer sur l'opportunité du voyage de l'imperatrice Frédéric—je constate seulement que en ce moment l'entente est difficile et que l'ère des difficultés n'est pas encore terminée.

En tout cas et en restant dans la question artistique, la seule qui puisse être traitée entre confrères, je déplore que les forces vives des deux grandes nations ne puissent encore se rapporter sur les manifestations fécondes de l'art ou de la science, et je veux espérer, q'un jour viendra bientôt, où, les differences politiques etant resolues, nous pourrons tous marcher ensemble, reconnaître les mérites de chacun et profiter les uns comme les autres des efforts faits dans la voie du progrès et de la paix artistique.

Quoi qu'il en soit, monsieur et honoré confrère, nous n'ignorons pas içi la valeur des architectes d'outre Rhin et, quelques soient les souvenirs et les violences qui nous separent, nous n'en éstimons pas moins leurs travaux et leur amour de l'art.

Ce sont les seules paroles d'appaisement et d'espérance, qui je puisse vous adresser voulant rester avec vous en seules rélations confraternelles et gardant en moi-même la religion de lambeau de la patrie, que nous ne saurions oublier.

Et maintenant, monsieur et honoré confrère, laissant de côté ces douloureuses pensées, je viens à vous qui êtes un artiste de grand talent vous remercier d'avoir pensé à moi dans cette occasion dont le résultat n'est pas celui qu'on aurait pu espérer.

Croyez à un sentiment d'estime confraternelle.

Charles Garnier.

According to the report on the Exhibition it seems that, besides Italy, Austria, the Netherlands, Switzerland, Russia, and England will have fairly representative architectural groups. We might here remind intending exhibitors that works can now be sent in for the Exhibition, the closing date being April 10.

THE Education Office have finally approved five schemes framed by the Charity Commissioners for the advancement of education amongst the skilled working-classes, under the City of London Parochial Charities Act, 1883. By one of the schemes the Saddlers' Company are vested with the control of their Robert Kitchin Charity, upon the understanding that after the deduction of 125*l.* yearly for the Company's renter-warden and costs of management, with 5*l.* 6s. 8d. yearly to St. Martin Orgar parish (by Eastcheap), the annual residue shall be applied to the governing body of the Northampton Institute (675*l.*) and to maintenance and repairs of St. Ethelburga's Church, by Bishopsgate (199*l.*). We may here mention that Kitchin, who died in 1555, devised to the Saddlers all his property in the parish of St. Olave, Hart-street, upon condition that they should distribute every Sunday 12 pence to 12 poor parishioners of St. Ethelburga, pay 15s. 4d. each Christmas-tide towards the church's repair, and give the warden an annual honorarium of 3s. 4d. The property now yields an income of 1,005*l.*, derived from houses in Jewry-street and Crutched-friars. Two other schemes relate to the Bow and Bromley and Aldenham (St. Pancras) Institutes. These ordain that in each case the annual sum of 150*l.* already devoted by the Commissioners for evening classes at the Institute shall continue to be paid for three years as from October 1, 1889, and that then the Commissioners, if so advised, shall make a scheme for the same. The later schemes will set up two governing bodies, and provide for the affiliation of the Institutes with, respectively, the People's Palace Institution and the Regent-street Polytechnic, or such other like Institutions as they may name. The two remaining schemes concern the joint Committee of the College for Men and Women, Queen's-square, and the Working Men's College, Great Ormond-street, Bloomsbury. In respect of each of these, the annual payment of 400*l.*, already settled by the Commissioners, will continue, subject to the appointment of a new governing body of ten, elected by the two Councils, and the making of fresh ordinances under which the students at either College shall be entitled to share in the facilities,—by way of lectures, library, museum, common-room, &c.,—open to those at the other; and for the establishment of joint classes, Saturday-night lectures, and the like.

THE Charity Commissioners have recently framed an order, under the Charitable Trusts Acts, 1853-87, for consolidating the Skinners' Company's almshouse and pension charities. In terms of the new scheme the Company will sell, or let on lease, their existing almshouses, and replace them with new buildings for six men and twelve women, who are to receive certain weekly allowances. One block of almshouses is No. 37 in Great St. Helens, Bishopsgate Within: its central panel is thus inscribed:—

THESE
ALMS HOUSES
WERE FOUNDED BY
SR ANDREW JUDD KT
CITIZEN & SKINNER
AND LORD MAYOR
OF LONDON
ANNO DOM: 1551.
FOR SIX POOR MEN
OF YE SAID COMPANY
REBUILT
BY YE SAID COMPANY
ANNO DOM: 1729

In the back yard is a fine leaden cistern embossed with the Company's coat-arms within three panels, and with date "1733." Judd, who died in 1558, and whose monument may be seen against the eastern wall of St. Helen's church, demised in part endowment for his school at Tunbridge, "a close of pasture . . . . called the Sandhills situate . . . . on the back side of Holborn," in St. Pancras parish, and then valued at 13*l.* 6s. 8d. per annum. In 1807 most of that land was let to James Burton, for ninety-nine years, at a rent of 2,500*l.* a year. At no distant time it will yield a large increase of income to the school. The other almshouse, being for twelve women, and founded by Lewis Newberry in 1633, is next to the Trinity almshouses in Mile End-road. The two endowments are greatly augmented by the Alice Smith (1592) and Henry Spurling (1730) bequests. These two bequests, together with the William Stoddart (1611), and portions of the Lancaster (1618) and Meredith (1630) charities, produce a total of 955*l.* applicable for the scheme. The Smith charity, now worth about 800*l.* a year, seems to have grown out of a demise of 15*l.* yearly to the Judd Almshouse and to certain poor in St. Gabriel, Fenchurch, and All Hallows, Lombard-street parishes. Meredith's endowment consisted originally of the Ram Inn, West Smithfield (since sold by the Skinners), whilst

Stoddart left to them a tenement with seventeen and a half acres at Harringay. This last-named trust the Company made over to Christ Hospital, together with their interest in the hospital premises, the governors agreeing, in exchange, to pay to the Company an annuity of 6*l.*, and to receive ten Skinners' nominees in the Bluecoat School.

A RECENT number of the *Transactions of the American Society of Civil Engineers* contains an interesting paper by Mr. N. W. Eayrs on "The Ventilation of Tunnels." The two methods by which the smoke and gases of combustion may be removed,—namely, by natural means, and by mechanical appliances, are described, and the Hoosac and St. Louis tunnels are taken as examples of the two systems. Whether the central shaft of the Hoosac tunnel really aids the ventilation appears doubtful, and we should have been glad if the author had given more information on this important point. As long ago as 1838 we find a statement by Mr. West in the very first volume of the "Proceedings of the Institute of Civil Engineers" that "shafts generally are an impediment to perfect ventilation," and it appears from the report of Mr. C. S. Storrow to the Massachusetts State Commissioners of Hoosac Tunnel, that the general feeling of those in charge of the large tunnels which he visited was, that it would be better to close all shafts and trust to the quick trains for ventilation; and Mr. H. S. Drinker, the author of a most important work on tunneling, seems to be of the same opinion.

THE architectural publisher, Ernst Wassmuth, of Berlin, has lately issued a neat card (compiled by Herr R. Schmidt), showing the most important erections of the world, drawn to the same scale, and arranged according to their respective heights. The card, on which the engineer's work is represented, as well as that of the architect, gives the Eiffel tower, with its 300 mètres height, the central position; then follow the mighty cable-towers of the proposed Hudson suspension bridge for New York, with 173 mètres height, a measurement double that of the towers of the Brooklyn Bridge, which only have 88 mètres. The National Museum at Turin (architect, Professor Antonelli) will have 164 mètres, the town-hall at Philadelphia has 163, the Ulm Cathedral tower shows 161, whilst those of Cologne Cathedral have 157 mètres. Of German churches marked on the card, we find the Strasburg Minster with 142 mètres, the St. Nicholas Church at Hamburg has 147, St. Catherine's, of the same city, has 111 mètres, and the proposed Dom for Berlin (design 1891), with its 110 mètres, is also marked. The list of the world's memorial monuments illustrated, is headed by the Washington Monument (with 169 mètres), and then follow the Hercules Monument at Cassel, 98 mètres, the Soldiers' and Sailors' Monument at Indianapolis, 80 mètres, the Victory Monument at Berlin, 61·5 mètres, and the Alexander Monument at St. Petersburg, with 50 mètres. As regards to mass, the Cheops pyramid, of course, still holds its own.

THE case of Perry *v.* Eames, which was recently decided by Mr. Justice Chitty, though it will, no doubt, in due time appear in the official reports, deserves an early notice. The point which was decided in it was that the Crown is not bound by the third section of the Prescription Act, in respect of the easement of light. In other words, although persons may have had the enjoyment of light over the property of the Crown (whether that property be held directly by the Crown, or equitably, for it matters not) for a long period of years, they have no more right to the light than if they had enjoyed it for one year only. When, as in the case before Mr. Justice Chitty, the property of the Crown has been transferred to private individuals, this places them in a very much more favourable position than if they had purchased from private owners. The land in question was that formerly the site of the old Bankruptcy Court in Basinghall-street, referred to in a "Note" recently. The practical importance of the case, however, is that it must put persons on their guard in reference to the purchase of property adjoining land of the Crown. For they may find themselves, to their surprise, with their buildings deprived of light after an enjoyment of many years, and without a legal remedy.

THE Edinburgh *Evening Dispatch* published last week a rough plan, showing the manner in which it is proposed to alter the external steps up to the Register House at Edinburgh (a building of Adam's, as our readers will remember), in order to throw back the boundary wall in front of the building, to gain more room in the street. The wide upper flight of steps, immediately facing the portico, is to be retained; the two curved wing flights are to be removed, and replaced by straight flights at right-angles to the upper flight, and parallel with the street. A considerable space is thus gained on the foot-pavement, but none to the roadway except to a slight degree at the turning into Leith-street. On the other hand the removal of the curved flights of steps will rob the building of half its dignity and architectural effect. It appears to us to be a most ill-judged injury to a fine architectural composition, carried out for a very questionable degree of practical convenience, and we much regret that it is to be done. The Scottish Board of Works is responsible for the scheme.

OPERATIONS have begun in connexion with the restoration of the nave of the Abbey Church at Haddington, under the superintendence of Messrs. Hay & Henderson, architects, Edinburgh. In the course of the operations it was discovered that the building contained a valuable library, the existence of which had gone out of mind, and which had lain unused probably for a century. It was found to contain, amongst other rare works, a fine black letter copy of the "Homilies of the Venerable Bede" (1533), which retained its original embossed binding; "The whole works of W. Tyndall, John Firth, and Dr. Barnes, three worthy Martyrs" (1573); a fine copy of Henry Stephen's "Translation of Herodotus" (Frankfort, 1594); and many beautiful editions of the Latin Fathers, some of them in the original binding, and having the printing strong and dark. There are also many theological treatises of the seventeenth century; several volumes of sermons preached before Parliament and during the Protectorate of Oliver Cromwell; sermons and pamphlets of the reigns of Charles II. and James II., one of which is by the notorious Dr. Oates, besides many other works of great value. There is a parish library in the town, which was attached to the Burgh School, and, were these two collections combined, they would form a good starting point for the formation of a free public library, were the inhabitants to adopt the provisions of the Act.

A COMMITTEE has been formed for the purpose of arranging for an Heraldic Exhibition, to be held in Edinburgh during the present year. Accommodation will be provided in the Historical Portrait Gallery.

THE Exhibition of the Institute of Painters in Water-colours suggests, as usual, a regret that the Institute has such large rooms to fill. At the time when they gave up their old small Gallery in Pall Mall they had hardly enough really good work to fill that; there seemed to have been some kind of vague idea that a fine building and a large suite of galleries would give new life to the Institute; unfortunately it only serves to emphasise their artistic poverty. There are works of the first order, no doubt, but they are nearly swamped in the medley of mediocrity, and worse than mediocrity. Mr. Austen Brown's "Feeding Calves" (15) is a fine study of real artistic power; Mr. Wimperis contributes two or three of his fresh and broadly executed landscapes which represent, more closely than any other contemporary work, the style and feeling of David Cox: "Reed Cutting" (122) is perhaps the best. Mr. Halswelle's large view of "Christ Church, Hants" (152) cannot be denied a certain power, but it exhibits even more than usual the defects of the flashy and pretentious style to which he has descended. Sir James Linton contributes three works, portraits, all splendid in colour and a delight to the eye in that way; "Miss Marjorie" (426), a young girl with a violin, which may be called a study in crimson; "Miss Agnes Ashbee" (234) in a green gown balanced by a red table-cloth; and "Mrs. F. G. Langham" (645), a study in rich warm browns. Mr. East has taken to illustrating London scenes, "Haverstock Hill" (371) and "At the Eyre Arms, St. John's Wood" (439), in which he fairly succeeds in combining local truth with artistic effect; but we preferred his landscape subjects. Among landscapes, besides those already mentioned, is a fine one by Mr. H. G. Hine, "On the Malling Hills" (640); "In Broadgate Park, Leicestershire" (657) by Mr. C. E. Johnson; "A Green Hillside" (534) by Mr. Joseph Knight, a remarkably real bit of country and clouds; "A Song of Spring" (484), an upland field with a girl driving calves, noticeable for its bright effect of morning light. Among figure pictures Mr. Stock has made a success with his figure of "The Temptation of Eve" (111); Mr. John Tenniel contributes a humorous study of "Gil Blas arraying himself in the Blue Velvet" (230); Mr. Frank Dadd paints the death of a Puritan soldier "The Captain of the Troop" (707), a composition with many figures but not very interesting; and Mr. Towneley Green has one or two of his small realistic paintings of everyday life, very careful, but which tend to become somewhat hard and dry in execution. The exhibition includes rather a large number of architectural subjects, among which are "York Minster from the City Wall" (71) by Mr. Harry Hine, a rather sensational view, shewing the cathedral bathed in a red light; Mr. F. S. Pilleau's "St. John the Baptist, France" (69); Miss Mawe's "Chapel of St. Erasmus, Westminster" (81), a large, highly-finished interior, very good as architectural drawing, though not very pictorial; Mr. Phené Spiers's "Whitby Abbey" (211); Miss Horton's "St. Bartholomew's Church" (229); Mr. Horn's large and ambitious drawing of St. Pauls (262), powerful in effect, but the curves of the dome are out of perspective; Mr. Harry Hine's "St. John's, Cambridge" (274); Mr. Macquoid's "Puerta de Santa Maria Burgos" (318); Mr. Fulleylove's "Ely Cathedral" (403), in which the architecture does not seem duly perpendicular; Mr. Lessore's "Entrance to the Ducal Palace" (480) and the same artist's "Notre Dame" (33)—the general effect is finely given, but the texture of the masonry is too woolly; Mr. Arthur Severn's large view of "Florence" (608); and Mr. F. Dillon's "Temple of Luxor" (615).

THE collection of the drawings of the late Charles Keene, at the Fine Art Society's Gallery, forms a most remarkable exhibition of power of draughtsmanship and of expression of character, conveyed in a method of execution which at first sight seems very ill adapted to definite expression in drawings on a small scale. Keene, it might be said, *painted* his subjects in pen line; he did not use outline or definite lines of delineation in making out his subjects, but worked by massing a number of lines to produce contrasts of light and shade. His freedom of style in this work, and the certainty with which he was able to produce the effect he aimed at, were alike remarkable. In the original drawings the effect is superior to the reproductions, as Keene frequently employed gradations of tone in the lines themselves, some

Hissarlik: from the "Old Scamander" River.

of which are in fainter ink than others; and these gradations were necessarily lost in a photographic reproduction. He did not carry it so far as to risk the loss of any important element in the effect; but the result in the reproductions was sometimes a hard, bristly appearance in the workmanship, which is not apparent to anything like the same extent in the originals. It is difficult to pick out any from this large collection, they are of such equal merit; we can only recommend readers to go and see them. As examples of Keene's power of giving what may be called professional character in a figure, we may mention his two clergymen in "The Sermon Question," the head waiter in "In Confidence" (39), and (still better) the two sketches of "Robert," 79 and 98; the middle-class young lady in "A Financial Crisis" (101): Keene generally avoided the lady proper, though he could draw her well on occasion. The omnibus-driver in "Characteristics" (171) is also an admirable type of his class; also the "lower middle class" man in the railway-carriage (180) who indignantly relates how he had ordered "chromios" to hang up in his house, and was put off with drawings "done by 'And—done by 'And, Sir!" The man's face is a perfect summary of the tradesman view of art. As a mere draughtsman Keene's powers were remarkable (see the foreshortened horse in No. 158); but he was much more than a draughtsman; he was a clear-sighted critic of life and manners. Mr. Claude Phillips does not tell us in his preface whether Keene invented his own subjects and dialogues. Many of the latter are as witty as the drawings which illustrate them.

THE small collection of works by Diaz, on view at the Goupil Galleries, rather tends to lead to the conclusion that Diaz was an over-rated man, and that his admiration for Rousseau did not do him much good. He endeavoured to imitate Rousseau's style, which was really not his own natural one, and he rather got hold of its weak than of its strong points. Diaz had a faculty, however, for giving the effect and the sentiment of deep woodland scenes only touched here and there by lights straggling through onto the stems of the trees, as in the unnumbered picture "In the Forest," perhaps the best in the collection. The large "L'Orage" (6) is too heavy and loaded in effect, and the same may be said of others, though there are some fine bits among them; and at all events Diaz is never commonplace.

CATALOGUE OF MOULDINGS.—In our notice of Mr. Samuel Elliott's catalogue of mouldings last week p. 214) we regret that by a slip of the pen we described him as of "Banbury." Of course we should have said "Newbury."

RECOLLECTIONS OF A VISIT TO HISSARLIK.

THE accompanying sketch represents pretty faithfully the appearance of the mound of Hissarlik, claimed by Dr. Schliemann as the site of Troy, as I saw it just twelve months ago, in March, 1890. It was then my good fortune to be, for a short time, the guest of the great explorer of lost cities, who was then beginning what has unhappily proved to be his last of his long series of researches.

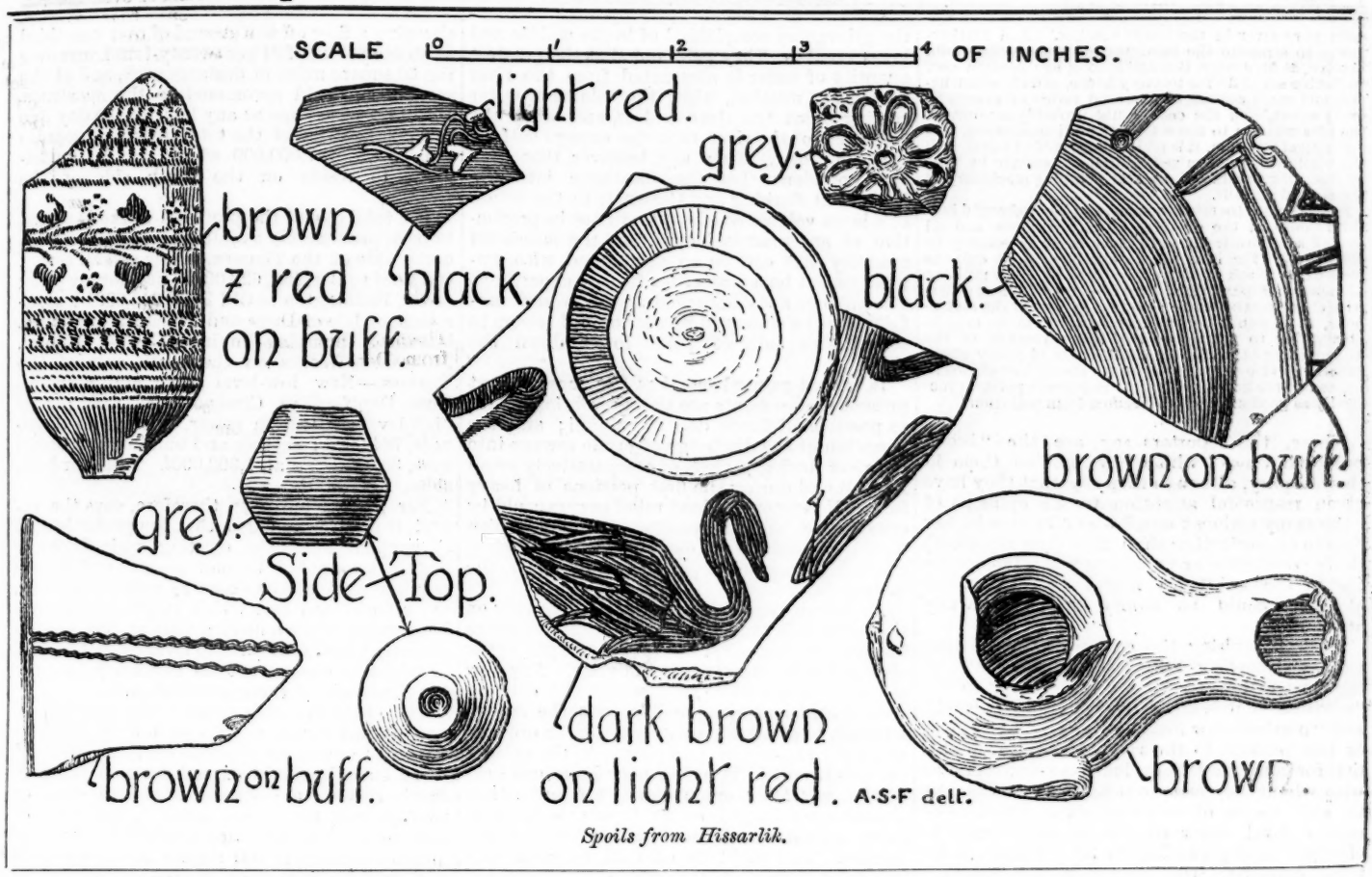
Having in a manner found my way there unexpectedly, or at least at very short notice, in the course of a holiday ramble, without having made any preparation by reading or otherwise for a critical examination of a place so large, important, and abounding in perplexities, and having been debarred by other arrangements from availing myself of Dr. Schliemann's generous hospitality for more than two days, a very inadequate period in which to study all the vexed problems of that famous site, it would be in vain to attempt to give a description of Hissarlik which might pretend to any archæological value, but a few words to explain these sketches, and some recollections of my host, may be of interest to those who have neither seen the place nor the man.

First of Dr. Schliemann himself; and indeed it was worth while going a very long journey only to see and converse with him, and especially where his exceptional characteristics could be best appreciated, when busy at his favourite pursuit, and on the spot with which his name must always be identified. The immediate impression he gave was that of being a really powerful man, a man of immense determination and energy, and I could easily imagine him as a great commander, if fate had led him to such an outlet for his abilities. Indeed, with his short, sturdy, upright build, quick, but firm and searching glance, ruddy, weather-beaten face, and close-cropped grey hair and moustache, he much more resembled a veteran general than answered to the usual conception of an antiquary. He appeared marvellously young for his age, both in bodily vigour and in activity of mind, and on getting to know him well (for being only a party of five, and camping out as we were in a very unconventional way, we got far more intimate than would elsewhere be possible even in a much longer time), I was as much drawn to him by his overflowing kindliness and good humour, as impressed by the sense of his strength. It would be difficult to find anywhere a more genial and thoroughly considerate host, and as the literary quarrels in which Dr. Schliemann was unhappily involved have given in some quarters an unfavourable idea of his personality, it is pleasing to have this opportunity of recording that my remembrance of him is entirely of experiencing the greatest courtesy and kindness. Moreover, however his scholarship may be found fault with, his mind was extremely well stored, and his readiness of wit remarkable, making him a most delightful companion; and though his faculty for languages is well known, the endless flow of the stories, jokes, anecdotes, and poetical quotations with which he entertained us, was really amazing. If he had his own choice, the conversation would have been chiefly carried on in Homeric Greek, but in deference to our unequal powers, he generally talked in English or French, though he must have run off at times into quite half a score of other languages, ancient or modern. His workmen, of whom there were about sixty, were some Greek and some Turkish, and during the whole of the very long working day, he seemed as it were to be supervising each man at the same time, directing every action, showing just where and how to work, whether with pick or shovel, basket or barrow, and all the time exhorting and encouraging every man in his own language.

In this occupation he was well seconded by Dr. Dörpfeld, who was also very kind about showing and describing the results of their labours, but, unfortunately, ignorance of German prevents me trying to reproduce much of what he said.

The general view of Hissarlik, which is reduced from a water-colour sketch done on the spot, is taken from the opposite bank of the little river called the Old Scamander, and shows how the mound rises sheer from the flat alluvial plain which extends down to the sea, about three miles distant. "Troy" itself occupied the outermost spur of the triangular tableland, on either side of which the Scamander and the Simois flow slowly along with many windings till they meet in the marshes a few furlongs below, while the later "New Troy" stretched out over the level upland behind it. The position must have been naturally a strong one, occupying the highest ground for a considerable distance around and partially protected by the marshy beds of the rivers for half its circumference, and was probably of great strategic importance as covering the entrances of all the valleys which converge at that point, against any enemy advancing inland from the coast. The present outline of the mound has been produced by the various trenches dug through it by Dr. Schliemann on his different visits, leaving pier-like masses standing up here and there, which show by their undisturbed vegetation the level of the former surface. Some of the trenches were at that time being driven further inwards with great zeal, and the dark-looking slopes at the nearest corner of the mound were formed by the fresh earth and stones just being tipped down, while the small figures above represent the working-parties, and may be useful as a scale to the whole scene. These last excavations were being carried on quite in modern engineering fashion, with the aid of good English or German tools, and even of four-wheeled iron trollies running on tram-lines, to which the picturesquely clothed, wild-looking labourers, and the armed *zaptieh* always on guard, formed an amusing contrast.

Among the small oak-trees on the ridge behind may be seen the wooden huts where Dr. Schliemann lived and lodged his visitors. It would be hopeless to try to describe all that is to be seen about the site without large extracts from books, and confining myself to actual impressions, it must in truth be said that to an ordinary traveller the place is somewhat bewildering, and appears very much easier to understand when looking at Dr. Schliemann's illustrated accounts of it than it does upon the



Spoils from Hissarlik.

spot; for when going about among the irregular-shaped cuttings and pits (some of them as much as fifty feet deep), it is not just a question of taking in a ground-plan, or even of several plans arranged as we are accustomed to see them, for the remains of the many cities which have successively occupied the site do not lie in anything like regular strata, but have become apparently so inextricably intermingled, from destruction by fire, ancient digging for foundations, and modern investigations, that it requires not only leisure, but considerable knowledge and imaginative power, to grasp the "Tale of Troy" as told by its latest narrator. But that at least four or five distinct epochs of ancient civilisation are there represented is plain even to the uninstructed eye from the masses of pre-historic walling, both of huge sun-dried bricks and of various kinds of masonry, still to be seen *in situ*, and from the numerous, though much-scattered, fragments of limestone and marble columns and entablatures, the workmanship of which attests both Greek and Macedonian, as well as Roman influence. Equally too are the many generations of ancient inhabitants and the varied character of their arts displayed by the immense quantity of pottery and terra-cotta with which all the ground is thickly sown, not only in the mound itself, but for several hundred yards back over the table-land also, but, unfortunately, generally in the condition of tiny shards of plain ware, so that only by long and diligent search could any pieces with distinct patterns be discovered, in spite of the encouragement given by Dr. Schliemann's kind permission to carry off any of our "finds." Some of these fragments are drawn here, but as they are mostly of late, *i.e.*, not "Homeric" date, our host did not care to say much about them. The one he thought most characteristic and worth preservation is the little "whorl" of grey terra-cotta, with a hole through it, which he pronounced to belong undoubtedly to Priam's Troy, where it was, probably, used as a weight in the process of spinning, though the same form was also multiplied for votive objects. The piece in the middle was apparently the bottom of a bowl, and is decorated with boldly-drawn representations of swans, put in with broad strokes of the brush with dark brown for the heads and reddish brown for the bodies on an unglazed ground of pale "light-red." On the left is a portion of a narrow straight-sided vase painted with bands of vine-leaves and grapes, and with a checquer pattern. Of the dates of these two I cannot speak with certainty, but the piece of the side of a cup with wavy lines is said, on good authority, to be pre-Greek, as also may be the portion of a black and buff bowl in the opposite corner; while the little bit with a red spray of ivy, on a ground of exquisite black glaze, looks like Greek work of the 4th century. The eight-leaved rosette is stamped in relief on grey terra-cotta, and was the only thing of the kind I saw there. The lamp is of the ordinary Roman type and fairly perfect. With these relics my reminiscences must end; and, without venturing an opinion as to the positive identity of Hissarlik with "Troy," I may at least say that, after realising the place and its surroundings, it is certainly the spot of all others where the grand legends which cling around the name of Troy take the most tangible and impressive shape.

A. S. F.

THE MAIN DRAINAGE OF LONDON:

PROPOSED ADDITIONAL WORKS.

WE have now before us the joint report of Sir Benjamin Baker and Mr. A. R. Binnie, Chief Engineer of the London County Council, on the main drainage question. The subject was referred to them by the Main Drainage Committee of the Council in December, 1889, the Council having by resolution expressed a desire for more information on the question, at the same time instructing the Committee to "secure the services of an eminent civil engineer to join the Engineer of the Council in a thorough examination of the whole sewage system." The engineers were desired to include in their report "an approximate estimate of the cost of taking the whole of the sewage to the sea, in accordance with the recommendation of the Royal Commission of 1884." The "instructions" given by the Committee to the engineers requested them to examine and report upon the operations at the precipitation and settling-tanks at Barking and Crossness, and upon the state of the river and its banks at different periods of the year. The engineers were also instructed to report as to what additional works were needed to supplement the existing main sewers, having regard not only to the present population and area, but to the possibilities of the increase and extension of those factors in the problem.

Now, apart altogether from future requirements, there are present needs of a very pressing and urgent nature which must be satisfied in the first instance. Many of our readers are only too well aware of the danger to health and the damage to property arising from the frequent flooding by sewage of certain low-lying parts of the metropolis, and this notwithstanding the costly relief sewers constructed of late years by the Metropolitan Board of Works. Even if the report of Sir Benjamin Baker and Mr. Binnie did not conclusively show it to be the case, it has been painfully apparent that the capacity of the large trunk sewers of the main drainage system, carried out by the late Sir Joseph Bazalgette nearly thirty years ago, has become inadequate for the requirements of the London of to-day. Concurrently with and as a consequence of the increase of population since Sir Joseph Bazalgette's scheme was carried out, there has been an enormous extension of the area built over, and therefore a corresponding increase in the area of roadways, pavements, roofs, yards, &c. In other words, there has been a very considerable augmentation of comparatively non-absorptive quick-draining surfaces, discharging rain-water so rapidly into the sewers that, in spite of the provision of a large number of storm overflows, floodings occur in some localities whenever there is a heavy rainfall. Not only have basements been flooded by the forcing-up of the contents of the sewers through the house-drains and traps, but the streets themselves have been turned into shallow canals, either by reason of the inability of the over-charged sewers to carry away the surface drainage, or in consequence of the regurgitation of the sewage through the gullies. It may well be that in some cases, where the basements are deep, the house-drain is put in at too low a level with regard to the level of the sewer; but as mistakes of this kind bring with them their own punishment, it is to be presumed that they are usually guarded against, and therefore we conclude that such errors are responsible for but a very small proportion of the damage done by such floodings. The primary and by far the predominant cause of the mischief is the incapacity of the sewers to cope with the sudden demands sometimes made upon them.

It will be asked, Why not separate the rain-water from the sewerage, or, at any rate, prevent as much of it as possible from entering the sewers? This question is referred to by Sir Benjamin Baker and Mr. Binnie in the introductory paragraph of their report. They say that "in approaching the consideration of the vast question of the whole sewerage system of the Metropolis and the state of the Thames as a practical problem," they had "clearly at once to recognise the fact that the general features of the main drainage system were unalterably settled, and must be accepted in the same way as the main lines of thoroughfares have to be accepted, whether quite as we could wish them to be or not." Under these circumstances they say that, as regards the condition of the Thames, they must admit the fact that—

"In the heart of the metropolis a certain amount o sewage pollution is inevitable, and it would be hopeless, as it is happily unnecessary, to attempt to get a chem-

cally pure river in the lower reaches. And furthermore, to separate the rainfall from the sewage would involve, as Sir Joseph Bazalgette long ago pointed out, 'a double set of drains to every house, and the construction and maintenance of a second series of sewers to every street,' and the cost would probably amount at the present time to some twenty millions sterling. As a practical question, it is no less impossible to deal with the whole volume of mixed rainfall and sewage by huge intercepting sewers and colossal pumping machinery at the several outfalls.

Sewage must therefore continue to be discharged into the Thames at the different storm overflows, and all idea of a theoretically pure river must necessarily be abandoned. For it would, in our opinion, be quite as reasonable to ask for the expenditure of many millions of money in separating sewage from rainfall, and otherwise changing the whole sewerage system of the metropolis, as it would be to expend an enormous sum in attempting to attain, in the lower reaches of the Thames, more than the reasonable state of purity which experience elsewhere and in other rivers has shown to be, as regards health and other important points, practically as good as absolute freedom from pollution."

These, the reporters say, are the "broad practical views" which have guided them in their inquiry, although they say that they have given respectful attention to the opinions of "the many eminent men" who aim at a higher degree of perfection than they (the reporters) think reasonable or expedient "if reference be had to the enormous initial cost at which alone it could be finally and successfully attained."

After describing the course of the existing main intercepting sewers on the north side of the river, which are known respectively as the "northern high level," "northern middle level," and "northern low level" sewers, and run more or less parallel to the river, the report states that for conveying the ordinary dry-weather flow with which they have to deal these sewers may be said to be of sufficient size. But as the middle level sewer in the Bayswater-road is charged in dry weather to 30 per cent. of its total capacity, the provision for rainfall, and for future increase of population, cannot be said to be adequate. The low level sewer, however, is taxed much beyond its power, the measured dry weather flow being equal to 70 per cent. of the *maximum* discharging capacity of the sewer; and, having regard to the frequent flooding complained of in the Isle of Dogs, Poplar, Hackney-wick, and Westminster, it is pointed out that relief for this portion of the system is urgently required; and, indeed, were it not for the thirty-four storm overflows into the Thames the existing state of affairs would be intolerable.

After describing the precipitation works at Barking, the sludge from which is conveyed by specially-constructed sludge-ships, named the *Bazalgette* and the *Barking*, to that part of the estuary of the Thames known as the "Barrow Deep" (see map), where it is stated to be distributed over a length of some eight or ten miles "in what is practically the open sea," the report goes on to speak of the main drainage system on the south side of the Thames.

The main drainage of the metropolis on the south side of the river is effected, like the drainage of the northern side, by three large intercepting sewers and their branches, known respectively as the southern low level, the southern high level, and the Effra branch sewers. The new precipitation works at Crossness, begun by the Metropolitan Board in 1888, at a total cost of about 330,000*l.*, are now approaching completion. Although the works cannot be fully brought into use until about the end of the present year, about sixteen million gallons of sewage per day are now chemically treated at Crossness. The reporters describe the chemical treatment at present adopted, and remark that they are not prepared to say that the present treatment of the metropolitan sewage must be considered as final, and insusceptible of future improvement, nor that it is the only process for effecting the desired end. At the same time they advise the Council without hesitation to continue the operations now being carried on, as a great improvement in the state of the river will assuredly result, when the entire volume of sewage flowing from both the north and south sides of the Thames is chemically treated and precipitated at Barking and Crossness.

This optimistic view of Sir Benjamin Baker and Mr. Binnie is somewhat discounted, it appears to us, when they go on to say, a little further on, that, in considering the present condition of the river Thames, it is, in their opinion, essential to direct the most serious attention to the constantly increasing abstraction of upland waters by the various water companies, which they consider to be a potent cause of many of the grievances complained of in the middle and lower reaches. They point out that the greatest quantity of water is abstracted from the river during dry weather, when the volume of water coming down the river is less, and when the condition of the river near the sewage outfalls is at its worst. They say, however, that they feel confident that the discharge into the Thames at Barking and Crossness in the future of a large volume of effluent will not be productive of any practical evils, but the *maximum* quantity that can be so discharged with impunity must be a matter for further experience. The balance not discharged at the present outfalls must be conveyed by new outfall sewers to some other suitable point lower down the river.

It is next pointed out that the most urgent present requirements are the prevention, as far as possible, of floods due to rainfall; and the cessation of the discharge of crude sewage into the river during periods of comparatively small rainfall and during the first portions of heavy falls. No system of flood relief sewers could be constructed within reasonable limits which would be capable of dealing with the heavy rainfall occasionally poured down upon the metropolitan area.

As before remarked, the low level sewer on the north side of the Thames is taxed far above its present capacity, and it discharges crude sewage too frequently into the river. Any new sewers constructed to supplement the existing ones should as far as possible, says the report, be made to discharge by gravitation in order to avoid the expense of pumping. As the present outfalls from Old Ford to Abbey Mills can only discharge 22,000 cubic feet per minute, they should be enlarged so as to enable them to carry forward at least 44,000 cubic feet per minute. This could be effected by constructing in addition to the two sewers already existing two others of equal capacity. Although the excess escaping into the Lea would be considerably reduced by the construction of the proposed sewers, it would still amount, in times of very heavy rainfall, when the three sewers were discharging their full volume, to 8,000 cubic feet per minute as compared with the present 17,000 cubic feet, but nearly all the small very offensive discharges would, it is asserted, be prevented altogether.

The reporters say that they are of opinion that some provision should be made at no distant date for taking into the Metropolitan system the flow from Tottenham, West Ham, Stratford, and the lower part of the Lea Valley.

As on the north side, so on the south, it is obvious, say the reporters, that any new sewers which may be proposed should, as far as possible, discharge by gravitation; but as a considerable portion of the flow from the present southern high-level and Effra branch sewers will require accommodation in the new sewers, owing to the insufficient size of the southern outfall sewer, this desideratum cannot be completely realised. Under these conditions, they consider that the most generally advantageous course would be to construct a new southern outfall sewer at about the same level as the existing one, extending from Greenwich and Deptford to Crossness, having a discharging capacity of 19,000 cubic feet per minute. At its commencement one branch sewer would connect with the present pumping station and southern outfall sewer at Deptford, and another one with the southern high-level and Effra branch sewers at Deptford-broadway, on the west side of Deptford Creek. In addition to the above new outfall sewer they consider that to improve the drainage and prevent floodings in the Beckenham, Dulwich, Lower Norwood, Streatham, Balham, and Brixton districts a new high-level sewer should be constructed which, draining the districts at greater altitude, would also tap and discharge the flow in ordinary rainy weather of the waters brought down by the old Falcon Brook stream, the upper part of the Effra, and the flow as far as possible of a portion of the Ravensbourne Valley. The discharging capacity of the sewer should be equal to about 19,000 cubic feet per minute, consequently were this and the proposed new outfall sewer constructed, the total discharging capacity at Crossness would be 57,000 cubic feet per minute as compared with 19,000 cubic feet per minute at the present time,—or, say, more than 510,000,000 gallons per day as compared with 170,000,000 gallons. The suggested new system of sewers would be capable of discharging a flow off the ground of over one-third of an inch of rainfall per twenty-four hours over the 60 square miles of drainage area, and at the same time would accommodate the *maximum* discharge of sewage at any hour of the day due to the proportion of the total increased population of about 7,000,000 which may be anticipated to reside on the south side of the river.

The total cost of the proposed works is stated to be approximately as follows:—Works on the north side of the Thames.—New outfall sewer, Old Ford to Barking, 620,000*l.*; new intercepting sewer, Paddington to Old Ford, 245,000*l.*; separation of Isle of Dogs and Hackney branches, including pumping-engines, 55,000*l.* Total, 920,000*l.* Works on the south side of the Thames.—New low-level sewer and branches from Deptford to Crossness, 427,000*l.*; new high-level gravitation sewer, Dulwich to Crossness, 784,000*l.*; engines and buildings at Crossness, 89,000*l.* Total, 1,300,000*l.* Total for both sides, 2,220,000*l.*

For present purposes, therefore, says the report, it may be assumed that the probable cost of supplementing the existing main-drainage system, to enable it to meet present and future requirements, will be about 2¼ millions sterling, exclusive of any cost which might be incurred in carrying the whole or a part of the sewage discharge farther down the river or to the sea. It would, of course, not be necessary to carry out the whole of these works at once.

The engineers also discuss the question of new outfall works, upon which they think it prudent to defer an ultimate decision. One of these outfalls would extend from Barking to Shell Haven, a distance of twenty-two or twenty-three miles (see map). The cost of this outfall is estimated at 1,600,000*l.* Another proposal is to go to the Maplin sands, upwards of fifty miles from Barking (see dotted line on map). The cost of 53¼ miles of outfall sewer and works, including a tunnel under the river from Crossness (to take the sewage of the south side), engines, buildings, and outfall works to discharge the crude sewage into deep water, would, they estimate, be not less than 8,000,000*l.* To this, of course, would have to be added the cost of pumping 280,000,000 gallons per day, which, on the basis of actual expenditure at the existing pumping-stations, but with improved machinery, would entail a probable annual charge of 80,000*l.* The estimate of 8,000,000*l.* may appear large, say the reporters, but it is in accord with previous estimates by other engineers and contractors.

In summarising their report and conclusions, Sir Benjamin Baker and Mr. Binnie say:—

"We have found on investigation that the most frequent cause of public complaint is due to the insufficient size of the main outfall sewers, which has led to floodings of the low districts and to the frequent discharge of much crude undiluted sewage into the Thames in the heart of the metropolis.

To remedy these immediate pressing evils, we have proposed the construction of new intercepting sewers on both sides of the river of sufficient size to provide for the sewage of a future population of 7,000,000, and also for a reasonable amount of rainfall, at a cost of about two and a quarter millions.

We are of opinion that detailed plans should be prepared of these works, and that no time should be lost in commencing such portions of them as are more immediately required.

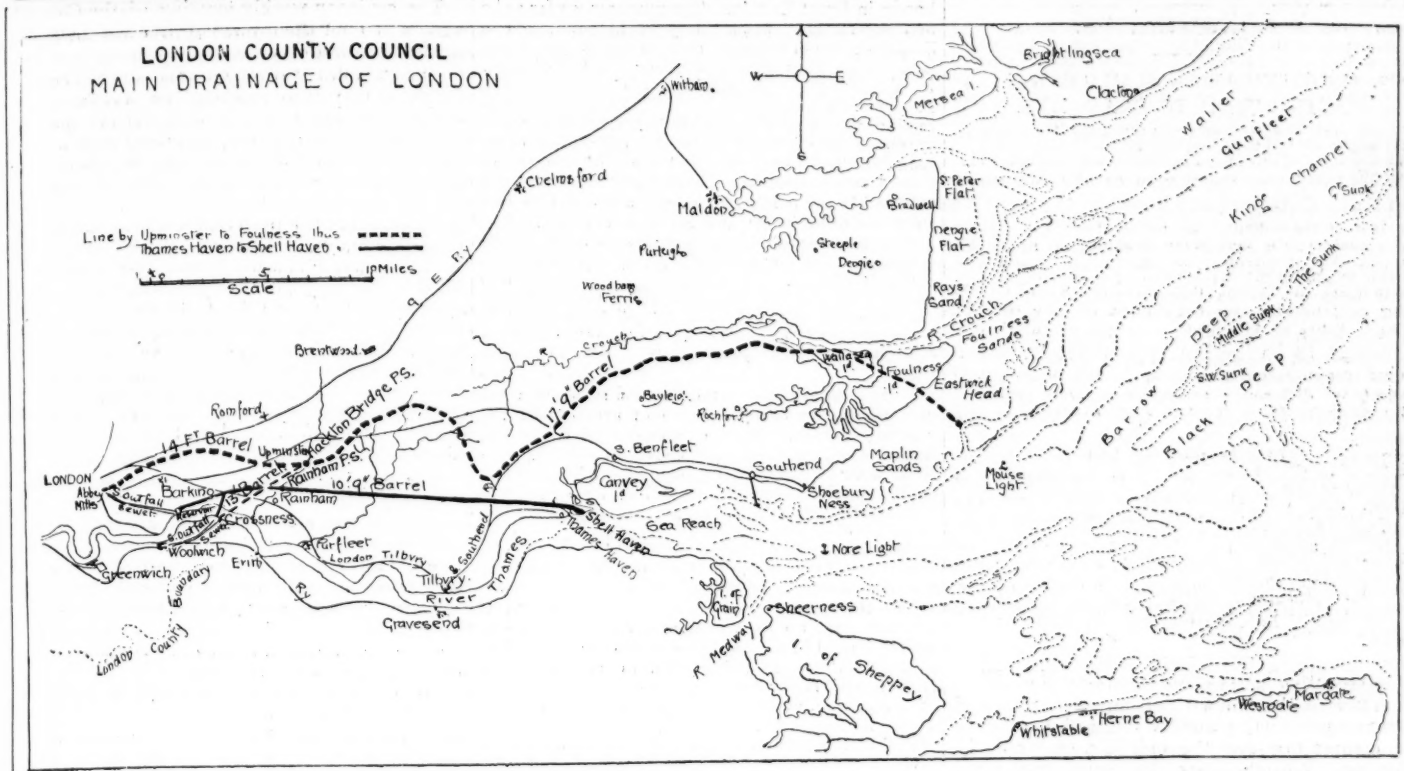
We do not think that the same urgency exists as regards the removal of the present outfalls to some point lower down the river or to the sea.

Having reference to the evidence given before the Royal Commissioners in 1883-4 and to the results of our inquiries and investigations generally, we have been led to the opinion that no new works should be entered upon until the precipitation works at Crossness as well as at Barking have been completed and in operation for a sufficient length of time to enable their effect upon the condition of the river to be ascertained beyond dispute or speculation.

Without anticipating what the exact results of that experience may be, we would point out that the removal of the solid impurities by precipitation must necessarily do away with many of the evils most seriously complained of by the Royal Commissioners in 1884, and we have little doubt that a large volume of the effluent water may continue to be discharged with impunity at Crossness and Barking. During the past half-century the river has never been free from sewage pollution, and experience has shown that, provided such pollution be kept within reasonable limits, no practical inconvenience results therefrom. We have seen nothing in past experience which would justify any alarm at the present state of affairs, or necessitate immediate action without waiting for the results of the completed works at Crossness and Barking outfalls.

We have concluded, however, that the whole of the future sewage should not be dealt with at those outfalls, but that an outfall must be found for a portion of it at a lower point in the river, where the effluent may find its way more directly to the sea.

After a most careful consideration of the question, we have reluctantly come to the conclusion that there is no point in the estuary of the Thames, or on the Essex coast near thereto, where the whole volume of the future sewage could be discharged in a crude condition without risk of returning up the Thames and



Map of the Estuary of the Thames, showing Proposed New Outfall Sewers for the Metropolitan Sewage.
(The Present Outfalls are at Barking and Crossness.)

other rivers, and of offensive deposits and consequent evils arising therefrom.*

Assuming, therefore, that the sewage must be treated at the new outfall, we have found that the latter might be conveniently placed at a point near Shell Haven in Sea Reach, and that there would be no advantage at all commensurate with the increased cost in taking the effluent further down the river.

Sufficient land might be reserved at any new outfall to enable the sludge to be in part dug into soil if it should be found advantageous to do this; but it would probably be found better to continue the use of sludge-ships as at present—that is to say, to deal with the sewage sludge in the same way as the river and dock sludge is dealt with on the Tyne, the Clyde, the Forth, and so many other rivers, by taking it well out to sea and discharging it.

Practically, therefore, the sewage might be said to be taken to the sea; but instead of being discharged in a crude condition at one point, it would be dealt with in two portions—the least offensive part—that is, the clarified sewage—being discharged some distance up the estuary, and the most offensive part—namely, the sludge—being deposited many miles out at sea. Of course, the latter alternative involves an increase in working expenses and a saving in capital expenditure. Assuming the annual charges, including interest, to be the same with any other two schemes, and the efficiency equal, we should prefer that scheme in which the capital expenditure was the least, because working expenses may be modified as experience is gained and improved methods introduced, but a mistake as regards capital expenditure cannot be remedied except by additional outlay.

We have estimated the cost of the works for conveying the whole of the crude sewage to the sea at 8,000,000*l.*, and the working expenses at 80,000*l.* per annum; as compared with a capital expenditure of 1,600,000*l.*, and working expenses of 50,000*l.*, for discharging a proportion of the sewage in a clarified condition at Shell Haven. To the working expenses in the latter case must be added the cost of precipitating at Barking and Crossness, and conveying to sea the amount of sludge to the existing sewage discharge.

As the growth of the population is gradual, the sewage system should be also of a progressive character, so as to minimise the loss of interest on unnecessary works.

We recommend, therefore, that such portions of the works included in our estimate of two and a quarter millions as are of pressing necessity should be at once commenced, but that the remainder of the works, including the new outfall sewer to Shell Haven, should not be immediately proceeded with."

As we stated last week, the Main Drainage Committee have presented a report to the Council recommending the preparation, without delay, of detailed plans of the proposed new sewers on both sides of the river, the cost of which is estimated, as stated in the last paragraph, at 2,250,000*l.*

* It should be mentioned that in a former portion of their report, Sir Benjamin Baker and Mr. Binnie say (p. 27) that if it were considered imperative to discharge the metropolitan sewage into the sea in its crude condition, without any risk of injury to the estuaries of the Thames, the Blackwater, and the Crouch, then the project of Messrs. Hassard & Tyrrell for an outfall sewer of fifty-six miles in length from Crossness to the deep water off Dungeness Point, on the coast of Kent, between Folkestone and Hastings, would be found worthy of serious consideration. (Pleasant for Folkestone and Hastings!)

THE ARCHITECTURAL ASSOCIATION VISITS:

THE TOWER BRIDGE.

THE third sessional visit of the Architectural Association, on the afternoon of Saturday, March 14, was attended by a very large number of members, who were attracted by the opportunity of inspecting the works now in progress for the construction of the Tower Bridge. The party met at the entrance adjacent to the Tower, and, under the courteous guidance of Mr. E. W. Crutwell, the Resident Engineer, were shown over the whole of the works on the north bank and the north pier. The present state of the works is an interesting one from an engineering point of view, though the architectural clothing which will be provided for the steel construction of the towers is at present entirely wanting. Some idea of the design for the bridge, of which we gave a general view in our issue of July 3, 1886, was obtained from an inspection of the working models, which included a model to a half-inch scale of the centre portion, and a model to a smaller scale of the entire bridge and its approaches.

The four steel columns which will occupy the four corners of the towers, and bear the weight of the bridge and the suspension chains, have now nearly been completed on the north pier. These columns are of octagonal section, and have been built up in position with steel plates, purpose-made angle-irons, and steel diaphragm plates every 3 ft. to give stiffness. Additional stiffness is also given to the centre of the side plates by rivetted vertical T-irons on the inside. Some of the massive girders which will form a platform at the level of the foot-bridge, and bind together the four columns, are already in position. The columns on the north bank, which will be the first bearing of the suspension chains, also appear to be nearly complete. These columns will be concealed in the small towers to the gateway in the illustration referred to. From the anchorages, which are below the level of the ground, and beneath the structure of the approaches, the chains will be suspended from the smaller towers on the banks, and from thence to the top of the high towers on the piers, on each side of the central span, and will also connect the latter, and form a support to the two independent foot-bridges at the higher level. The suspending chains to the side span appear to take the form of inverted segmental lattice girders, with a joint at the junction of the two curves from the higher and the lower towers. The central span, which will be reserved for the passage of vessels with masts and funnels, is 200 ft. in length, and this will be bridged at the lower level by two leaves, which may be compared to two balanced cantilevers opening and closing against the vertical face of the towers when required for the passage of vessels. These leaves, as well as the passenger lifts in each tower, will be worked by hydraulic machinery for which space has been provided in the structure of the piers. It is estimated that the lower part of the central span will be required to be hoisted about ten times each tide, as that is the average number of vessels with tall masts which need access to the warehouses and wharves situated between this point and London Bridge, but as it is probable that many of these vessels may be fitted with "tabernacle" masts and funnels it is not considered that the interruption to the wheeled traffic will be very material, whilst the foot traffic will be continuous by means of the lifts and the two foot-bridges at the higher level. The force of the tide at this part of the river appears to have been prejudicial to the adoption of the swing bridge of which such a good example exists at Newcastle-on-Tyne; the adoption of this would have been dangerous to vessels, especially those obliged to take up a position quite close to the bridge.

Cornish granite has been used freely in the construction of the piers and the approaches; whilst red brick, with stone dressing, will be used in the erection of the towers. The steel work has been carried out by Messrs. Wm. Arrol & Co., who were also contractors for the Forth Bridge; and the masonry is being executed by Messrs. Perry & Co. As is well known, Mr. J. Wolfe Barry is the engineer-in-chief, the architectural portion of the bridge having been designed by the late Sir Horace Jones, City Architect.

IMPROVEMENTS AT LUDGATE-HILL.—On November 16, 1889, we printed a paragraph to show that up to that date a total gross sum of 324,326*l.* had been expended in the widening of this thoroughfare by the gradual setting back and rebuilding of its southern side. The houses hitherto taken for that purpose were numbered 11 to 71, with No. 5, St. Martin's-court. In July, 1889, the City Commissioners of Sewers resolved to proceed to serve notices, and acquire the freeholds in respect of No. 1, and of so much as might be required of Nos. 5, 7, and 9. We now hear that the interest in No. 1, Ludgate-hill, has been acquired for 3,500*l.*, making a total of 26,000*l.* for the premises at that corner. So, ere long, the entire improvement will be completed. The old tower, of which we printed an illustration on June 15, 1889, stood just opposite to the tower of St. Martin, Ludgate; the superstructure, at least, of the City-wall may yet be traced in the Canons' garden, Amen-court, and in Newgate Prison, where its coat of plaster is inscribed with the initial letters of buried felons.

Illustrations.

ARCHITECTURAL COMPOSITION; ATTRIBUTED TO BRAMANTE.

THIS is the design which was referred to by Mr. H. H. Statham (page 111, *ante*) in the course of the discussion on Baron de Geymüller's paper at the Institute a few weeks ago. As there described, it is interesting as a Renaissance study of an architectural composition which is symmetrically arranged in regard to general mass but differing entirely in the treatment of the details. The heights of the main cornices are obviously intended to correspond approximately, with a view to symmetrical effect, though their treatment is different; and the lower story is colonnaded on one side and vaulted on the other.

It is reproduced from an old print in the British Museum. There are two copies of this view, and one showing the view from the opposite side, which does not differ much from this. It appears probable that the engraving itself is not one of Bramante's own work; but in all probability it represents a design of his, being so labelled in the half-effaced inscription at the top of the plate.

CHELSEA POLYTECHNIC INSTITUTE.

WE give this week the perspective view and the two principal plans of the design selected in competition for this building, by Mr. J. M. Brydon. We described the design and plans at some length in our notice of the competition drawings in the *Builder* of last week (p. 202); for the rest the design and plans speak for themselves, as to the arrangements and the architecture.

The front is intended to be carried out in red brick, with stone for the window-dressings, cornices, pilasters, &c., to correspond with the public library next to which it is to be built, and which is by the same architect.

VILLAS, DYNAS POWIS.

THESE villas are now in course of completion, on a very pleasant site on the new road made to Barry from Cardiff, close by the new Dynas Powis Railway Station. They are set back 150 ft. from the road (having a south-east aspect), with walls of stone and brick, obtainable in the neighbourhood, faced with hammer-dressed Westra (local) stone, all the mouldings, jambs, arches, lintels, sills, &c., being executed in Corsham Down stone, from the Bath stone firms. The quoins at the angles of the building are of pressed buff bricks, and the whole is jointed in black mortar. The roofs are slated, and have deep overhanging eaves of 18-in. projection, with feet of rafters wrought and cut and boarded on top.

The half-timber work is framed together with projecting oak-pins, and will stand out slightly from face of cement when finished.

The halls and passages will be tiled with encaustic-tile pavements and the kitchens with plain tiles. The hall-doors and fanlights, with cut and moulded heads, will be filled in with leaded lights of various tints. In addition to the rooms shown on the plans, provision is made for six bedrooms, bath-room, drying-room and box-room, and other conveniences.

The works are carried out from the designs and under the superintendence of Mr. W. H. Dashwood Caple, of Cardiff. Mr. R. Jones of Cardiff is contractor for excavating, bricklaying, drainage &c.; Messrs Alexander & Co., of Cardiff, for joinery; Mr. W. Rees, of Dynas Powis, for carpentry and fittings; Mr. W. H. Allen, of Cardiff, for plumbing. Messrs. Morrell's ash-sifting earth-closets are to be used for servants' conveniences: special drainage arrangements are made for the w.c.'s in the houses.

The total cost when finished is estimated at 1,750*l.*

ANCIENT COPED STONES, CORNWALL.

THE illustrations of these are from drawings by Mr. Arthur G. Langdon, and were originally made to illustrate a communication on the subject read to the British Archæological Association in November last. The following *résumé* of this paper will be of interest in connexion with the illustrations:—

"Having briefly introduced the subject, Mr. Langdon gave a list of the coped stones at present known in Great Britain. The numbers, so far as he had ascertained, were thirty in England, ten in Scotland, two in Orkney, and one in Wales, there being none known in Ireland or the Isle of Man. In examining the geographical distribution of the Hiberno-Saxon monuments in England, an interesting fact was disclosed—viz., that the three examples in Cornwall were the only ones to be found in the West of England, for, with the exception of one in Kent and one in Sussex, the rest were confined to the north and north-east districts, and were unknown below the Midland counties. Following this came some general remarks as to the origin of these monuments, several different kinds being mentioned. Mr. Langdon then proceeded to describe each of the Cornish examples separately, two of which were to be seen in the churchyards of Lanivet and St. Tudy—both near Bodmin; and the third in the churchyard at St. Buryan—between Penzance and the Land's End, all three being executed in granite. The Lanivet stone was the best, and in an excellent state of preservation; it was boat-shaped, with a cable-moulded ridge, and hipped ends, on which were beasts in a sitting position, their backs forming the hips of the stone. This example, which measured 7 ft. 7 in. long, was richly ornamented, the sides and coped portion being covered with diagonal key patterns; the only other monument having a similar design upon it, was a cross at Penally, Wales. On the ends of the tomb were interlaced knots.

The St. Tudy stone was next taken, which it appears was, up to a comparatively recent date, deeply buried in the churchyard until discovered by some workmen in 1873, who, in removing the accumulated rubbish consequent on the restoration of the church, accidentally exposed the top of it. It was not, however, thoroughly examined until the spring of 1889, when it was then raised up to the level of the ground. On inspection it proved to be a very fine example, 7 ft. 1½ in. long, and of a unique shape,—wedge-like in form, with hipped ends. The ornament in the south slope of the top consisted of debased foliated scroll-work, while on the north slope there was a curious panel, composed of a four-cord broken plait, combined at one end with a square key pattern. Rude arcading decorated the sides,—there being five bays on one side and six on the other, with an upright stalk and leaf in the spandrils between each. On the wider end a triquetra knot, and bead-work on either of the perpendicular surfaces below, but there were no animals.

The third and last, at St. Buryan, was stated to be only a fragment, 2 ft. 7 in. long, which he found by accident amongst a miscellaneous heap of carved stones that had been piled against the tower after the restoration of the church. The fragment was part of a boat-shaped tomb, but was in such a mutilated condition that only a small piece of diagonal key-pattern ornament—like that on the Sancreed crosses—was now distinguishable, and that this one was included in his paper, since it completed the series of those known in Cornwall."

COMPETITIONS.

CHURCH INSTITUTE AND SCHOOLS, HIGHER TRANMERE.—In a recent competition for a Church Institute and Schools, Higher Tranmere, Cheshire, Mr. J. Berrington obtained the first place, Mr Chas. R. Chidson the second, and Mr. Charles Wise the third. The accommodation to be provided was a hall to seat 500 persons, with class-rooms for about 150 children, and the sum to be expended 1,500*l.*

THE LONDON COUNTY COUNCIL.

A SPECIAL meeting of the London County Council was held on Friday, the 13th inst., in the County Hall, Spring-gardens, the Chairman, Sir John Lubbock, presiding.

The Water Question.—After considerable discussion, it was resolved, on the recommendation of the Parliamentary Committee,—

"1. That the opposition to the London Water Commission Bill be continued, and that the Metropolis Water Supply Bill be opposed.

2. That in the event of these Bills being referred to a Select Committee, we should be instructed to intimate to the Committee on behalf of the Council that this Council approves the principles indicated in this report,* and is prepared to undertake the question of the water supply of London subject to the following conditions:—That powers should be conferred on this Council for the introduction into Parliament of Bills dealing with the water question, including the establishment of a new supply, and the improvement of the existing supplies, should further investigation prove such a course to be desirable, and that the Chairman of the Council be requested to introduce into Parliament a public Bill with this object, with the view of its being referred to the same Committee as the several pending Water Bills.

3. That copies of this report be sent by the Clerk of the Council to each Vestry and District Board in the Metropolis in sufficient numbers for distribution."

* We will give a *résumé* of the report next week.

The ordinary weekly meeting of the Council was held on Tuesday last, Sir John Lubbock again presiding.

The Late Sir Joseph Bazalgette.—The Chairman said he had no doubt that the members of the Council had seen with regret the announcement of the death of Sir Joseph Bazalgette, who was for so many years the Chief Engineer of the body of whom they were the successors. He felt sure that it would be their desire that an expression of their condolence with the family of Sir Joseph should be given. This was agreed to unanimously.

Revision of Salaries.—A great part of the time of the sitting, as well as of that of the special meeting on the 13th inst., was taken up with a wrangle over proposed increases of salaries. Amongst the increases agreed to on Tuesday was one to Mr. Harper, the Assistant Valuer, from 350*l.* to 400*l.*; and one to Mr. Dibdin, the Chemist, from 600*l.* to 700*l.*

The Blackwall Tunnel.—The Bridges and Parliamentary Committee, to whom jointly was referred a year ago the consideration of certain questions relating to this project (which the Council has since practically decided to carry out, as we stated in our issue of the 28th ult., p. 170), now reported, recommending as follows:—

"(1) That no steps be taken to obtain modifications of the existing powers as to works.

(2) That it is not expedient to apply for a Bill containing provisions as to the method of providing for the future expense of carrying out the works and approaches of the Blackwall Tunnel which should throw any charge upon the property adjoining the present approaches for benefits conferred not under the Act by which the charge is to be imposed, but for benefits conferred in consequence of the execution of the works and approaches under the Act of 1887."

These recommendations were agreed to.

On the report of the Special Committee on Contracts being reached, the Council was counted out just before 8 o'clock.

ARCHITECTURAL SOCIETIES.

LEEDS AND YORKSHIRE ARCHITECTURAL SOCIETY.—A lecture under the auspices of this Society was delivered at the Law Institute, Albion-place, on Tuesday evening last, by Mr. G. F. Charnock, Lecturer on Engineering at the Bradford Technical College, entitled, "Some Recent Practice in the Design of Ironwork for Buildings." There was a good attendance of members, and Mr. Charnock's clear and lucid manner of explaining his diagrams as they were thrown upon the sheet by the lantern enabled everyone to follow the lecturer with great interest. At the close of the lecture a vote of thanks was proposed by Mr. Buckley, and seconded by Mr. Hall and carried. The President of the Society, Mr. W. H. Thorp, F.R.I.B.A., at the commencement of the evening, spoke of the loss the Society had sustained by the death of one of their members, Major Moore, and proposed a vote of condolence with his widow. Mr. Bulmer seconded the motion, which was carried.

MANCHESTER ARCHITECTURAL ASSOCIATION.—The last ordinary meeting of this Society was held at the Diocesan Buildings, Manchester, on Tuesday, Mr. T. Chadwick, President, in the chair. The following gentlemen were elected as officers for the coming session: President, Mr. T. Chadwick, A.R.I.B.A.; Vice-Presidents, Messrs. J. D. Mould, A.R.I.B.A., and P. Hesketh, A.R.I.B.A.; Treasurer, Mr. A. H. Davies-Colley, A.R.I.B.A.; Librarian, Mr. J. S. Hodgson; Registrar, Mr. J. H. Woodhouse; Secretary, Mr. J. D. Mould; Committee, Messrs. P. E. Barker, A.R.I.B.A., E. Hewitt, A.R.I.B.A., E. P. Hinde, A.R.I.B.A., F. W. Mee, W. E. Potts, A.R.I.B.A., F. B. Smith, H. E. Stelfox, A.R.I.B.A., and G. H. Willoughby. Mr. Edgar Wood read a paper on "An Architect's Study of Colour." A discussion followed, in which Messrs. Hill, Hesketh, Potts, and Mee took part.

EDINBURGH ARCHITECTURAL ASSOCIATION.—This association met on the 12th inst. under the presidency of Mr. W. W. Robertson. The Chairman referred to the death of Mr. Dick Peddie, and moved that the secretary be instructed to convey an expression of sympathy to the members of his family. Mr. G. S. Aitken seconded the motion, which was adopted. Mr. Archibald Macpherson, architect, read a paper on "Some elements of design," in continuation of a former paper dealing with supposed theories of proportioning buildings in Mediæval times, and bringing his enquiries down to the beginning of the seventeenth century. In the plaster

ceilings of these times there was some evidence of design having been set out on a geometrical basis. He concluded by urging the study of the proportions of old buildings by some method such as an application of geometric figures, which would enable the character of the proportions to be easily distinguished.

DUNDEE INSTITUTE OF ARCHITECTURE.—The fourth ordinary meeting of the Dundee Institute of Architecture, Science, and Art, was held on the 12th inst., when a lecture on "Modern Church Architecture," was delivered by Mr. John Kinross, President of the Edinburgh Architectural Association. Mr. Charles Ower, A.M. Inst. C.E., the President of the Institute, occupied the chair. Mr. Kinross, at the outset, compared modern with old church architecture. It would be absurd, he said, to assert that old work, if not strong, was beautiful, because some was positively ugly; but at the same time there was a large amount of their old ecclesiastical work which was grand and beautiful. It remained with them, if they were to hold their own with it, to try and excel in design, and to gather round them a school of higher craftsmen, who would throw their skill into intricate moulding work, beautiful carving, decorative colour, and all the other work that goes to make a monumental building.

SURREY ARCHÆOLOGICAL SOCIETY.

THE annual meeting of this Society was held at 8, Danes Inn, Strand, on Wednesday afternoon, the President, Lord Midleton, in the chair. The Council submitted their thirty-sixth annual report, together with the cash account and statement of assets and liabilities to December 31, 1890. The report mentions that an afternoon meeting of the Society was held at Wimbledon, on Saturday, June 14, under the presidency of Viscount Midleton. The Church, the Camp on the Common, and Eagle House, the residence of T. G. Jackson, Esq., F.S.A., were visited, and papers read on the same. The annual excursion took place on Wednesday, July 23, under the presidency of Major Alfred Heales, F.S.A., when the Society visited Little Bookham Church, Great Bookham Church, "Fairfield," once the residence of Madame d'Arblay, also in the village of Great Bookham; Slyfields Manor House, and Stoke d'Abernon Church and Manor.* Part I., vol. X, of the "Transactions" was issued to members in June last. The concluding part of the same volume is now in the press, and will shortly be issued. The number of members is now, 314, viz.:—Annual, 215; life, 95; honorary, 4. During the year 34 new members have been elected, viz.:—28 annual and 6 life. By death, the Society has lost 8 members, viz.:—5 annual, 2 life, and 1 honorary. By resignation, 14 members. Gain over loss, 12. During the year a sum of 50*l.* has been added to the reserve fund, which now consists of the sum of 389*l.* 16s. 3d. 2¾ per Cent. Consols. A sum of 82*l.* is still due to the reserve fund on account of life compositions received during the years 1889-90. The Council in their report express the great thanks that the Society owes to its Honorary Secretaries for the general management of its affairs. Several valuable additions have been made to the Library during the past year. In the next part of the "Transactions" will appear the first instalment of the Catalogue of the Church Plate of the County. The Society is much indebted to the Rev. T. S. Cooper, one of the Honorary Secretaries, for much patient labour and research in compiling the same. A circular relating to the Archæological Survey or Map of the County has been issued to all Members The Council desires to point out the great importance of this work, and the necessity for the co-operation of all members in order to ensure accuracy. The Society was again represented at the Second Conference of Societies in Union with the Society of Antiquaries of London, held at Burlington House, on Tuesday, July 15. A valuable report on Parish Registers, and other details of the Conference, will be printed in the next part of the "Transactions."—The report was adopted, and some formal business transacted.

PHOTOGRAPHIC SOCIETY.—An exhibition of collotype printing is announced at the rooms of the Society 50 Great Russell-street Bloomsbury, to open on April 14.

* Reports of the proceedings on both occasion appeared in the *Builder* at the time.

FREE LECTURES TO ARTISANS AT CARPENTERS' HALL:

PROF. MARSHALL WARD ON "TIMBER: ITS GROWTH AND DECAY."

THE third* of the present series of free lectures to artisans and others was delivered on the evening of Wednesday, the 25th ult., at Carpenters' Hall, London-wall, by Prof. Marshall Ward, M.A., F.R.S., his subject being "Timber: its Growth and Decay."

The chair was taken by Sir J. C. Lawrence, Bart., and there was a good attendance.

Professor Ward, who illustrated his lecture by means of the lantern, referred to the growth of timber, and to the point of view in which it was looked at by the timber-merchant, the carpenter, the chemist, and the botanist. He described in a clear and simple manner the annual growth of the wood, and showed illustrations of transverse sections of common deal grown under different circumstances, that grown in Northern Europe being close-grained, and contrasting with the same species of tree grown in a warmer climate, in which the concentric rings were much wider apart, and the wood soft and woolly. In dealing with the question of decay, he showed an oak with part of its trunk decayed, where a branch had been broken off. The decay in this instance was caused by exposure, whereas, if the fracture had been cut clean off and covered with some protective matter, the wound would often be healed over by the growth of the cambium. Moisture had a great deal to do with the decay of timber; the moisture, if dirty, bringing with it the spores of certain kinds of fungi. At the same time, the decay of trees was not always to be attributed to the action of fungi. Trees often died from the action of acid gases, which killed off the leaves year by year, the leaves being the means of feeding the cambium. In other cases the decay of timber was due to the attacks of fungi, and notably from those of the common toadstool. It had only been discovered of late years by a German botanist that a fungus could, while the tree was alive, destroy its wood by decay The fungus made its way into the roots of the standing timber, and slowly worked up the stem. Many other species of fungi which had hitherto been considered harmless were now known to attack timber, and to be the cause *ab initio* of its decay. The lecturer here exhibited on the screen an illustration of a piece of oak wood, which had been hollowed out as if by the agency of beetles, but which had really been attacked by fungi. Other illustrations of wood attacked by fungi showed that in each case the ravages were of a different character. The dry-rot fungus was in the habit of attacking deal and other woods, causing the surface to crack up, and eventually to crumble between the fingers like powder. At a certain stage of dry-rot, the fungus came to the surface of the wood, especially where there was a damp and warm atmosphere. The action of the dry-rot fungus gradually broke down the thickness of the woody tubes, besides which juices were secreted which had the power of dissolving the substances of which the wood was composed. By this action, the tubes were broken to pieces, and eventually their substance passed into a state of solution. Therefore, although the action varied somewhat in detail, the decay of the timber was caused by the breaking down of the tubular structure of the wood by means of these destructive fungi.

PROF. J. M. THOMSON ON THE CHEMISTRY OF BUILDING MATERIALS.

THE fourth lecture of the series was delivered on Wednesday, the 4th inst., by Professor J. M. Thomson, F.C.S., F.R.S.E., his subject being "Some Points in the Chemistry of Building Materials," with experiments. Mr. Alfred Preston presided, in the absence of Mr. Charles Barry, F.R.I.B.A., and there was again a large attendance.

Professor Thomson commenced his lecture by dividing the subject-matter under the following heads:—(*a*) Stones, (*b*) Bricks, (*c*) Mortars and Cements. He proceeded then to subdivide the group of materials, such as stones, into hard or silicious stones, as granites, basalt and porphyry; sandstones, where the grains of silicious material are bound together by some slightly cementing material; and soft stones, generally obtained from the limestones, and most commonly employed in the South of England. He pointed out the important part which was played by silica and the silicic acids in the harder varieties of stone, and illustrated by experiments the hard and insoluble nature of the former. He also showed experimentally how the soluble varieties of silicic acid might be obtained, and explained fully the separation of crystalline from colloidal or non-crystalline bodies by the process of dialysis. After showing the insolubility of silicious materials, Professor Thomson spoke of the action of various substances on such hard rocks, and illustrated his remarks by showing the volatility of a silicious compound, viz., silicon fluoride, and demonstrated the action of hydro-fluoric acid, and its use in the decomposition of silicates. To show the difference between the varieties of stone mentioned, Professor Thomson immersed blocks of granite, sandstone, Dolomitic limestone, and marble in baths of weak acid, when the action of the acid on the different varieties of the stone was very apparent, the limestone and marble yielding rapidly to the action. A brief description was then given of the use of the soluble silicates in the manufacture of artificial stone, by mixing fine sand with the silicate, stamping into moulds, and then, when partially dry, hardening the mass in a bath of calcium chloride, which coats, and to some extent penetrates, the stone with insoluble calcium silicate. Reference was next made to the binding effect produced by heating the silicates; and to the conversion of ferrous into ferric compounds in the weathering, and action of air upon the stone. These two points were illustrated by the burning of a white clay brick, which came from the kiln hardened, and at the same time reddened by the conversion of the ferrous carbonate into ferric oxide. Professor Thomson then spoke of the second class of stones or limestones, such as are found at Portland, Bath, Purbeck, Ancaster, and Caen, illustrating how easily they could be decomposed by heat and acids, a portion of limestone being heated and the carbonic acid gas collected. The action of atmospheric carbon dioxide, and its action when dissolved in water, was then shown upon limestone, the soluble bicarbonates formed being rapidly dissolved. Passing from the consideration of the limestones, Professor Thomson pointed out that they naturally led to the consideration of mortars and cements formed from substances provided by the burning of limestones. Under building cements could be considered three distinct divisions, namely, mortar, plaster of Paris, and hydraulic cements. After dealing with the question of lime-burning, and lime-slaking or hydration, he passed to the consideration of the nature of common mortars formed by moist lime and sand, and showed by tables the similarity in composition between ancient and modern mortars. Professor Thomson then spoke of the setting and hardening of mortars, indicating that they may be regarded as two distinct processes, the setting being merely the drying, but the hardening being evidently due to the absorption of carbon dioxide by the dried lime. In connexion with this, the lecturer pointed out the absence of absorption of CO_2 by moist lime, stating that wet mortar absorbed only about 1 per cent. of its weight in a week, still remaining soft; whilst mortar in a drying atmosphere absorbed about 14 per cent. in a day. He pointed out the inadvisability of rapid drying, which has a tendency to powder the material. Apparently the admixture of sand in the mortar is not necessary, but facilitates the conversion of the grains of calcium hydrate into carbonate by separating them from each other. The lecturer then dealt with the production and hardening of plaster of Paris, showing first the dehydration of that substance at moderate temperatures, and then the absorption of water during the process of hardening. With regard to hydraulic limes or mortars, Professor Thomson showed that they must all be regarded as silicated mortars, and that their power of hardening related very distinctly to the amount of clay in the limestone, pointing out that the quantities ranged from 5·3 to 8·2 in a feebly hydraulic lime, rising through different stages to from 19·1 to 21·8 in a hydraulic lime, but that the limit was reached when the lime contained more than 26·7 per cent. of clay. In conclusion, he pointed out that good cements should contain no free lime, as they should not swell when set; that they probably contain calcium silicates and calcium aluminates; and that during the process of hardening the tri-calcium compounds undergo decomposition, forming hydrated calcic ortho-silicates and aluminates, these forming during the setting of the mortar a mass of crystals of the hydrated compounds binding the whole together.

* For brief reports of the previous lectures see pp. 151, 174, *ante*.

The fifth lecture of the series was delivered on Wednesday, the 11th inst., by Mr. Thomas Blashill, F.R.I.B.A., who took as his subject "The Carpenter and the House." A report of this lecture is in type, but is unavoidably held over until next week.

The sixth and last lecture of the series was delivered by Professor Banister Fletcher, F.R.I.B.A., on Wednesday evening last, on "Architecture, its Civic and Commercial Value." Sir John Lubbock presided, and there was a good attendance. We hope to be able to give some notes of this lecture next week.

NEW FONT, CARLISLE CATHEDRAL.—A new font has been erected in Carlisle Cathedral by Mr. F. W. Pomeroy, London, from the designs of Sir Arthur Blomfield. The font stands in what remains of the nave of the Cathedral, upon two hexagonal steps of coloured marble placed on a square coloured marble floor, with ornamental border. It is of Hopton Wood stone. The bowl is hexagonal in form. In each alternate side there is a groined niche containing a bronze statuette, and the other sides or panels are filled in with tracery. The font is surrounded by an iron canopy, designed by Sir Arthur Blomfield, and executed by Messrs. Starkie, Gardner, & Co., London.

Books.

The Gentleman's Magazine Library; being a classified collection of the chief contents of the *Gentleman's Magazine* from 1731 to 1868. Edited by G. LAWRENCE GOMME, F.S.A., Architectural Antiquities, Part II. London: Elliot Stock. 1891.

THIS is a second volume of the reprint of architectural articles from the *Gentleman's Magazine*, the first volume of which we noticed at the time of its appearance. This volume consists entirely of Carter's articles on the architecture of different periods of English history, with special and lengthy additional notes on some of the English Cathedrals. These are well worth republishing as a record of the view taken of English architecture by an architect and archæologist who in his appreciation of the monuments of the past was far in advance of his own day, and in fact was in a manner the herald and forerunner of that reverence for ancient work which has been in the present day carried to rather an illogical extreme, but which hardly existed in this country at the time when Carter with his protests appeared as a *vox clamantis in sicco.*

Carter's descriptions of Early Gothic buildings are brief and incomplete, and he classes as Saxon what is now known as Norman; the editor inserts a *caveat* as to this. It is not impossible, on the other hand, that some buildings, or portions of buildings, now called Norman may in reality be Saxon; *e.g.*, Waltham Abbey. The amount of insight into the true spirit and meaning of Gothic architecture, however, which Carter shows when he comes to speak of thirteenth-century Gothic, is truly remarkable for a man writing in the "dark ages" of 1810.

"The clusters of columns to all situations are masoned in one solid mass ["masoned" is good] in their several courses without bands, the shafts rising from base to capital in a clear and uninterrupted line. This circumstance of the disuse of bands is thus accounted for; the small surrounding columns project little more than half a diameter from the main central column. The groins present tracery, compartments, &c.; and it should appear that the great aim of the architects at this period was to embellish the faces and lines of their structures in the most brilliant and luxurious manner, as each particular in the interiors was gilded and painted in various colours; a kind of fascinating principle was everywhere afloat to rivet attention, and to claim unceasing admiration. Every decoration had its peculiar grace and peculiar use; accommodation and convenience were ever combined with some ornamental beauty, and some masonic security."

The nomenclature of modern Gothic criticism, it would be perceived, was not fixed yet, but the spirit of Carter's remarks is exceedingly discriminating, nor can we overlook the spirit of enthusiasm which pervades his remarks. When he turns to find all these qualities "nowhere more wonderfully brought upon our view" than in the case of York Minster, perhaps the modern critic will suggest a note of interrogation; but it was not to be expected that in those days the most loving writer on Gothic should have attained to a perception of the finer differences of style, proportion, and detail.

The Tudor-Gothic in its finest examples, King's College and Henry VII.'s Chapel, stirs Carter to still higher enthusiasm: "it is now that a plunge is made at once into a sea of new architectural splendour, and which may perhaps be thought to carry with it more of original or self-devised style than is manifested in any previous composure of the kind, where we always note a progressive line of creation, one rising, as it were, on the disuse of the other." There is much truth in this rather exuberantly expressed criticism, and no doubt Tudor-Gothic was wonderfully fortunate in being worked out in so complete a manner, so undisturbed by the intrusion of any other variety of style, as at King's College. From the Tudor style Carter proceeds to the description of Elizabethan and subsequent buildings; the Temple Hall, Burleigh House (which he finishes off rather briefly), Hatfield House, and so on through a long series of buildings, down to the opening of the Georgian era.

Carter's additional notes are on York and Durham, which he treats at great length, on "Construction in Norman Domestic Architecture," and on "Norman Domestic Architecture," with one or two other subsidiary subjects. In some remarks on the Norman north-west tower of Canterbury, "lately destroyed," he advances a theory about Norman construction which is rather the reverse of that entertained by those who have been concerned more recently in the necessary reconstruction of some Norman and Early Gothic monuments. We have lately been accustomed to speak with astonishment of the constructive carelessness of the Normans and Early Gothic architects in depending on a shell of masonry filled in with rubble. Carter takes the opposite view: He says "the strength of a Norman wall is in its core, when this crumbles and fades away, as in the present instance, the fate of the building is decided. But I question the modesty and justness of any reflection upon the failure, so to name it, of a fabric which has stood full six centuries and a half." Carter evidently regards the rubble and mortar as the real construction, the strong part of the wall, in fact as a kind of concrete (though he does not use that word), only of larger pieces than concrete proper is formed of; the external masonry being merely a decorative architectural facing. His respect for the building which had stood six centuries and a half is somewhat too indulgent, for after all we cannot doubt that if the Normans had built their great piers of solid bonded masonry, and been more particular about the foundations, they might have stood for many more centuries. But the suggestion that the interior portion of their piers was intended to stand as a conglomerate or concrete, depending on the cohesion of the mortar in which the rubble was embedded, and that this mortar has in process of time disintegrated and the centre portion of the pier consequently lost cohesion, is worth taking into account. It is not creditable to the manufacture of the mortar, certainly, but it may suggest the doubt whether after all the Normans were quite so reckless in their intentions and method of building as they have been supposed to have been.

The book generally is one of great interest both for the record contained in it of buildings that have disappeared, and also as a kind of literary monument to a man who was quite ahead of his contemporaries in the intelligent interest which he took in the architectural remains of his country. Of the manner in which his views were regarded at the time an amusing instance is given in the preface, from a letter which appeared in the *Gentleman's Magazine* for 1813, in which the writer says he had inquired at Westminster whether Mr. John Carter, "your occasional architectural correspondent," was among the candidates for the vacant office of architect. The person he addressed did not know, but observed that in any case Mr. Carter "could not be considered an eligible person, from his strong propensity to preserve the works of antiquity unaltered; and besides, he had been heard to declare publicly that if he had a casting vote on the question of rebuilding Henry VII.'s chapel, he would instantly give it for stopping all further proceedings, except repairing such parts as absolutely required it." It is curious to reflect that eighty years ago such sentiments should be quoted as a reproach against an architect.

A Book of Houses. By ERNEST NEWTON Architect. London: B. T. Batsford. 1891.

THE object of this book, which the author has "dedicated, by permission, to his master, R. Norman Shaw, R.A.," is to show what kind of houses of individual type and character people may build for themselves as their own homes, at a moderate outlay. Mr. Newton observes that it "has somehow become an accepted fact that people of moderate means may not even contemplate the possession of a house of their own"; and so they settle down into sets of houses all alike, presenting neither any architectural beauty nor any special character which may suit the special character of each inhabitant. To encourage an emancipation from this state of things, the author gives representations of houses which have been built in or near London at prices varying from 1,400*l.* to 2,200*l.* each. They are each illustrated by two photographs (reproduced by Messrs. Sprague & Co.) and two plans.

As may be expected, the houses belong entirely to one school, which may be characterised as the modern domestic picturesque, in which the use of bay-windows apparently supporting an overhanging soffit or projection is a favourite feature, though this is not indulged in too often in the present collection As may be expected from the prices named, the appearance of the small buildings is not very solid; there is a little too much of the Bedford Park type about them. The walls are mostly tile-hung on the upper portion, and how slender a construction may be veiled behind these tiles we all know. The houses are, however, nearly all picturesque and without any kind of pretention unless it be in the rather emphatic declaration of unpretentiousness, which may itself become a kind of affectation; they have, however, an interesting variety of treatment and character within the limits allowed by general similarity of manner. The three small windows near the entrance of No. 3; the simple pillared porch of No. 6; the large segmental bay window of No. 7, appropriately giving cheerfulness to the drawing and to the nursery over; all these are incidents which give individual and home-like character: and it is almost needless to say that there is nothing in bad taste. The plans have received careful attention, and are very compact and convenient; in the upper plan of No. 4 it would have been better to have taken the bath-room door into the little lobby next the w.c., for the purpose (which should be aimed at in small houses even more than in large ones) of masking the identity of the latter apartment; in one or two other plans this is rather overlooked. The size of the rooms, when tested by scale, becomes rather Liliputian; drawing-room 15 ft. 6 in. by 12 ft. exclusive of small bay window; dining-room 15 ft. by 11 ft. 6 in. with similar reservation; kitchen 12 ft. by 10 ft.; backstairs 2 ft. 6 in. wide &c. (House No. 4). The eye is deceived at first as to scale by the fact that all external walls, or nearly all, are 9 in. on the upper story. That is of course one way in which it has been possible to build these pretty and really inviting-looking little "homes" for the small sums named in the preface. But we cannot say that in this climate we can regard outer walls 9 in. thick as adequate for comfort; and then there is the question of durability. When people of little wealth put their savings into a house of their own, as Mr. Newton wishes to encourage them to do, they naturally wish to regard their house as a permanent possession to be inherited afterwards by other generations. But we fear these sort of houses with 9-in. outer walls, however pretty, are not likely to serve for many generations, and the idea that satisfactory residences can be built at so cheap a rate must be taken *cum grano.*

We observe that none of the plans have the north and south point marked on them. This should never be omitted on a house plan, as the aspect of sitting-rooms forms (or ought to form) an important element in the arrangement of plan.

Mixed Metals or Metallic Alloys. By ARTHUR H. HIORNS, Principal, School of Metallurgy, Birmingham and Midland Institute. London: Macmillan.

THIS is a useful little work by a competent and practical writer. Alloys generally have properties differing from their constituents,—sometimes widely so. Some metals, when mixed to form alloys, evolve heat: others, when they unite absorb heat; thus a mixture of lead, tin, and bismuth added to mercury will act like a freezing mixture. Professor Spring's experiments on the effect of pressure on different metallic powders are referred to; he showed that under a pressure of 2,000 atmospheres, or 13 tons to the square inch, lead, in the form of filings, became compressed to a solid block; and under a pressure of 5,000 atmospheres the metal flows through all the cracks of the apparatus like a liquid. Attempts were made to produce alloys by pressure alone, and there seems to be some evidence that true union of the metallic particles can be effected in the cold by pressure alone.

The numerous and extremely important series of alloys in which copper forms the leading metal have naturally a large place accorded to them. It is interesting to observe that while traces of foreign metals will often exert an injurious effect upon the copper, yet when these same metals are added in considerable quantity a useful alloy results. For example, 1 per cent. of zinc in copper will make it hard and red short, but 20 per cent. of zinc alloyed with 80 per cent. of copper will produce an exceedingly malleable alloy. The copper-zinc alloys, known as brasses, vary widely in their characters and adaptability to various purposes. Certain varieties of brass are exceedingly malleable and ductile, and these properties, combined with the variety

of shades of colour obtained by suitable mixing, and the moderate cost, render them most valuable for ornamental purposes. Brass possesses all the necessary advantages as a constructive material for works of art, and, with the aid of lacquers, resists the action of the atmosphere remarkably well.

The valuable tables on the "Properties of Copper-zinc Alloys Collated for the Committee on Alloys appointed by the United States Board (Report, Vol. II. 1881)," are a useful feature of the work. The peculiar susceptibility of brass to undergo molecular change is illustrated in the statement that: Wire-drawers assert that if brass wire is annealed directly it has been taken off the drum on which it has been wound during the process of wire-drawing, it will fly to pieces. This effect is prevented by subjecting the coil of wire, after its removal from the drum, to strong concussion, by seizing one part of the coil with the hands, and striking it heavily against a bench several times. Vibration, it is affirmed, is the cause at times of a molecular change in brass chandelier chains, causing them to snap without apparent cause. Delta metal, which is a variety of brass containing a proportion of iron, receives a good deal of attention. Its power of resisting corrosion, often makes it specially valuable, while it also possesses great strength, toughness, and durability.

Bronzes are compounds consisting chiefly of copper and tin, but which like the brasses, are often modified by the addition of other metals. A table which is given of the composition of ancient bronzes will be found of great interest. According to the amount of tin present in bronze the colour varies between red and white, and with a large excess of tin it becomes steel-grey. Generally speaking tin whitens copper more than zinc, seventy-three parts of copper and twenty-seven parts of tin forming a white alloy. The greatest strength is found in that variety of bronze known as gun-metal, which contains about ninety per cent. of copper and ten per cent. of tin. Elaborate tables of the copper-tin alloys, by the United States Committee already referred to, are included.

Silicon-bronze promises to become a very valuable material, especially for telegraphic and telephonic purposes. The alloy is nearly equal to pure copper in its power of conducting electricity, and much superior to the previously used phosphor bronze. Mr. W. H. Preece states that phosphorus has a most injurious influence on the electrical conductivity of bronze, and that silicon-bronze is far superior and has entirely replaced phosphor-bronze for telegraphic purposes. It is also important to note that although wires made from this alloy are very much lighter than ordinary wires, they are of equal strength, and it is affirmed that, if broken, they will not fall to the ground as the ordinary ones do; but by reason of their high elasticity, they spring back and coil up close to the standards. It will occur to most readers that, if this assertion is well based, no more ordinary overhead wires should be in future permitted,—at any rate, in towns,—when an elastic silicon-bronze wire is available which will obviously, if it really possesses the properties claimed for it, prevent those shocking accidents which have given overhead wires so bad a name.

Geometrical Drawing for Art-Students. By J. H. MORRIS. London: Longmans, Green, & Co.

Practical Plane and Solid Geometry. By J. H. MORRIS. London: Longmans, Green, & Co.

Descriptive Geometry. By T. H. EAGLES, M.A. London: Walter Scott.

ALL that it is necessary for an art-student to know about geometry is contained in the little book by Mr. Morris on "Geometrical Drawing." Commencing with a short introductory chapter on the instruments needed, and the way to use them, he proceeds to define the various terms used in geometry, and to work out all the ordinary problems, from bisecting a given straight line, to the construction of an ellipse or a spiral, and as a figure is in all cases attached, the student should find no difficulty in making himself acquainted with the methods employed. To test the learner's progress, a large number of exercises are given, taken from the examination papers of the Science and Art Department and other sources. At the end of the book, a chapter is devoted to Elementary Solid Geometry, and most of the ordinary problems in this part of the subject are dealt with in a very complete manner.

In "Practical Plane and Solid Geometry," Mr. Morris has furnished a text-book which contains sufficient not only for candidates for the elementary examination of the Science and Art Department, but also for the general student of geometry. The work forms one of Longmans' Elementary Science Manuals, but, except that it is somewhat larger and treats the subject in a more advanced manner, it does not differ materially from the book for art students by the same author.

The book on descriptive geometry by Mr. T. H. Eagles, has been written for those who wish to make themselves thoroughly conversant with the principles of geometrical drawing, and are not contented with a knowledge of the mere outlines of the subject. To work through a book such as this will, no doubt, be beneficial to students, if only for the exercise of the reasoning powers which it will necessitate, but at the present day those who are desirous of becoming successful architects or engineers have not sufficient time at their disposal to warrant them in trying to master any comprehensive treatise on geometrical drawing, and they will, in our opinion, be more profitably employed in acquiring knowledge which there is a probability they may require in after years in the actual practice of their profession. It is certainly of the greatest importance to thoroughly understand the fundamental principles of geometry and their practical application, but in order that the student can "show that the focal hyperbola of a given ellipsoid passes through the umbilics," as he is asked to do by the author on page 297, he must give an amount of time to the subject, which simply means he has neglected others, many of which we consider would be of far greater value to him in every-day life.

The Principles of Perspective as Applied to Model Drawing and Sketching from Nature. By G. TROBRIDGE. Second Edition, revised and enlarged. London: Cassell & Co.

THIS is a small and compact little book on perspective, which aims at avoiding theory and a multiplicity of complicated diagrams, and practically teaching perspective, while in the act of making a drawing. It is always difficult to be sure whether definitions and directions which appear so simple to those who already understand perspective are as simple and obvious to a beginner. What we find in this little book, as in many others, is that there is hardly a clear enough statement of the reason why there is a horizontal line, a picture plane, and a vanishing-point; though the way it actually works, so to speak, is pretty clearly shown by examples (a brick wall with the joints in perspective, for instance). The student is told that when looking at a landscape from a low level, the horizontal line will be low, and that it will be high when looking from a higher level, and two small sketches are given which illustrate the fact. But there seems a want of an attempt to put in plain words what may be called the philosophy of the fact—the why and wherefore. It is no doubt a difficult thing to do, but it does not seem to be sufficiently attempted. The drawing on the window pane with transparent paper is after all the best practical example of what appears to all beginners the mystery of perspective.

Apart from this defect, which it has in common with nearly all books on perspective, this is a useful little book, and some practical hints thrown out by the way, such as the use of a pencil or rule to hold between the eye and the object in sketching landscape or buildings, by way of grasping the actual direction of a line on the picture plane, are very useful. In sketching buildings this kind of testing of the main lines at the outset often saves much trouble afterwards.

Memorials of Old Chelsea. By ALFRED BEAVER. Nos. 1 and 2. London: Elliot Stock.

THESE are the first two parts of a book which is appearing in a serial form. So far, it is a historical account of the neighbourhood, with illustrations of its former state, reproduced from old plates or copied from old drawings. The neighbourhood is one in which much interest has been aroused in recent years, and the book, when completed, will be an agreeable and useful memorial of its history.

Correspondence.

To the Editor of THE BUILDER.

BYZANTINE ARCHITECTURE.

SIR,—I have been very much interested in the able lectures of Professor Aitchison, and agree with him in thinking that we are much indebted to M. Choisy for the aid he has given us towards the better knowledge of Roman and Byzantine construction.

To him and to Professor Middleton we owe a debt of gratitude for their researches into the practice of monolithic construction, and to MM. Perrot and Chipiez and to Professor Baldwin Brown for the light they have thrown on its origin,—a form of construction which is largely used in the present day, and is likely to to be still more largely adopted.

I venture, however, to think that Professor Aitchison, following the lead of M. Choisy, is mistaken in describing the core of Roman work as "rubble." Rubble walling is generally understood, and is practically defined by the various regulations for its use, to be a construction of stone of an inferior sort, and, as such, is required to be thicker than a wall of dressed stone or brick. Its strength depends on the careful interweaving of its parts, and on its being bonded with more or less frequency. It requires the work of a skilled man, and such skill is the stock-in-trade of a good waller. It need not necessarily be built with any mortar at all, for in this district dry rubble walls are of common occurrence. Roman work differs materially from this. The rubble is an accident, an accessory, which may be replaced by any other suitable aggregate; the essential is the mortar or cement, which unites the whole mass into a coherent conglomerate, and forms a monolith of equal strength throughout, without necessarily any tie or bond. A construction such as this is, I think, properly described as of concrete, for I hold that it matters little how the conglomerate is formed provided that the result attained is the formation of a monolith.

All the evidence we have goes to prove that the Romans, as is the practice now, varied their method of formation to meet different requirements; in the case of partition walls, referred to by Professor Middleton, the concrete would naturally be almost of the nature of a fine grout, with here and there a filling popped in, as is now the practice, to fill up a pocket. On the other hand, in walls of great thickness, such as those of the Pantheon, it seems probable that within the area of the encasements, all the processes necessary for the construction of the wall were carried on; not only so, but it seems reasonable to suppose that within that area workmen's stairs of access and convenience for the delivery of material were contrived, which, to some extent, may account for the arches and so forth found in the brick encasement of the Pantheon.

M. Choisy appears to think that the object of the brick or stone facing was to protect the core from rain; but hydraulic cement is bettered by wet.

Professor Middleton appears to think it was of no use at all, and that the Roman builders knew it to be so,—that, in fact, it was merely a survival of some forgotten mode of building, as are the buttons behind one's coat of a former style of dress. I am strongly of opinion that the facing of brick or stone formed the actual encasement within which the conglomerate was packed, and formed an essential part of the construction, and that, except under special circumstances, no other casing was required. Take, for instance, the construction we meet with in England. In "The Celt, the Roman, and the Saxon," the author, Mr. Thomas Wright, describes the construction thus—"The facing stones were first built up to a certain height, and set in mortar of a firmer and better description; then fresh liquid mortar was poured in in large quantities, and, in the space between, heaps of rubble or stones were cast in with it, and the whole soon hardened into a solid mass." Mr. Wright did not pretend to be a practical builder, and is, therefore, not quite accurate in his description; but, in my opinion, he laid hold of the essentials of their method. Dr. Bruce, in his "Roman Wall," says that he is enabled to state, on the authority of engineers well acquainted with the Roman wall, that the mortar of that structure is precisely similar to the grout and concrete of the present day. When used as concrete, the mass will set in three hours, and have solidity suffi-

cient to bear the weight of a man, and, in about three days it will have acquired a rock-like firmness. To let the wall speak for itself:—

From Bowness on the west to Wallsend on the east coast, it consists of two external facings of stone, without a tie or bond from end to end; the stones which form these two facings taper and have their smaller ends towards the core or inside of the wall, so that if the stones touched each other, or had merely a layer of mortar on their outer beds, there was a vacancy of some three or four inches between the faces of their inner beds, which thus formed a toothing for the reception of the concrete, and so enabled the whole to be formed into one coherent monolith.

In the same way, the triangular bricks we find in use in Rome were specially contrived to form on their inner face a series of similar toothings for the reception of the concrete or of the coarse mortar which formed its essential part.

M. Choisy appears to think that with such an encasement concrete could not be rammed, but in my opinion it is a mistake ever to think of concrete as a fluid mass, and in its application in the present day concrete has always to be spread over the surface or space it is intended to fill. It will stand where floors of 7 in. or 8 in. in thickness are being formed with an almost upright edge. It is a common occurrence to see concrete laid on one part of a bay of centreing and being rammed in the same bay with no encasement whatever. It appears to me, therefore, conclusive that the Roman method of building was of concrete, and that the object of the encasements or other additions to it was to enable the mass to carry itself as the work progressed; if it was not the case that work done yesterday was sufficiently stable to carry that of the following day, I fail tosee what possible scaffolding or temporary encasement of wood could be contrived to carry walls of the height and weight of Roman walls built above the ground. I am unable to throw any more light on the interesting theory worked out by M. Choisy as to the ribs of tile work carried out in the vaulting. I have not recently been in Rome, and the traces of these ribs are difficult to discover; but it appears to me that if such vaults as we find in Rome were to be carried out now, some such system of dividing the work into sections as that illustrated by him would have to be adoped, if for no other reason than for the purpose of counteracting the expansion likely to occur in so large a mass, and that it would have the effect of making the vault self-supporting as the work was being proceeded with.

The writings of MM. Perrot and Chipiez, and the interesting paper by Professor Baldwin Brown on the origin of Imperial architecture, go to prove that the Romans did not invent concrete, but by their universal use of it they made it essentially their work; and it is interesting to note how, down to Norman times, the endeavour to build in the Roman manner is still to be traced, not only to some extent in their walling, but in such details as the formation of circular staircases on a core of concrete, and even in the arches of the arcades of such churches as St. Peter's, Northampton, and Melbourne, in Derbyshire, where the facing stones of the arches form an encasement only, the soffit of the arches being of concrete, and without a tie or bond to be seen.

CHARLES J. FERGUSON, F.S.A.

Carlisle.

INTERNATIONAL FINE ART EXHIBITION AT BERLIN.

SIR,—We are directed by the Council of the Royal Institute of British Architects to inform you that they have accepted an invitation, sent in the name of the Berlin Institute of Architects, to select a certain number of architectural drawings and photographs for the International Fine Art Exhibition to be opened at Berlin in May, under the patronage of the Empress Frederick, Princess Royal of Great Britain and Ireland.

The drawings or photographs to be selected must be of architectural works executed during recent years, and "representative of the methods at present most dominant in English architecture." The cost of packing, transporting, and insuring the same, to and from the Exhibition, will be defrayed by the authorities in Berlin. No works of art of any kind which were exhibited at the Great Exhibition held in Berlin in 1886 will be admitted.

We are also to ask you, Sir, to allow us to state in your columns that architects, whether members or not of the Royal Institute, who may be desirous of sending drawings or photographs of their executed works to the International Exhibition above-named, are requested to forward their names and addresses,—with the subjects and sizes of their proposed exhibits,—to "The Secretary, R.I.B.A., 9, Conduit-street, Hanover-square, London, W.," not later than noon on Monday, 23rd instant.—We are, sir, your obedient servants,

ASTON WEBB, Hon. Secretary.
WILLIAM H. WHITE, Secretary.

Royal Institute of British Architects,
9, Conduit-street, Hanover-square, London, W.,
March 17, 1891.

COMPTON WYNYATES.

SIR,—In connexion with the beautiful measured drawings of that most interesting house, Compton Winyates, may I remind your readers that a series of photographs taken by me when the house was visited by the Architectural Association in 1885, appeared in the *Builder* of March 20, 1886, as illustrations to a paper read before the Architectural Association by Mr. S. Flint Clarkson?

Dublin. JOHN L. ROBINSON.

The Student's Column.

VENTILATION AND WARMING.—XI.

LOSS OF POWER IN DUCTS AND FLUES.

OF very high importance, to the architect especially, is the loss of power that results in ducts and flues from contraction, change of direction, and friction. This loss of power is taken account of in our general formula by the factor ΣC, and to obtain the value of this, the experimental results obtained by Péclet are generally utilised.

We will give a table of co-efficients deduced from Péclet's observations, and then show how these can be practically applied.

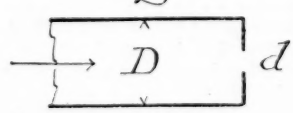
Loss of power results when the air is forced from a duct of greater section through an opening or duct of less section, and conversely a gain of power ensues when the change is from the lesser to the greater section.

If we take P for the power necessary in the first section to obtain any particular velocity, and p for the corresponding power in the second section, and C for the co-efficient of loss or gain, the loss or gain in either case is Cp—

that is, $P - p = \pm Cp$, and $\frac{P}{1+c} = p$.

Case 1.—Outflow from duct through narrow opening into free space.

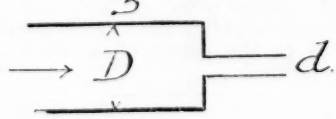
FIG. 12.



When $\frac{d}{D}$ is less than	0·1	C =	1·367
=	0·1	=	1·366
=	0·2	=	1·60
=	0·3	=	1·44
=	0·4	=	1·30
=	0·5	=	1·23
=	0·6	=	1·16
=	0·7	=	0 83
=	0·8	=	0·56
=	0·9	=	0·32
=	1·0	=	0·

Case 2.—Outflow from duct into one of lesser diameter.

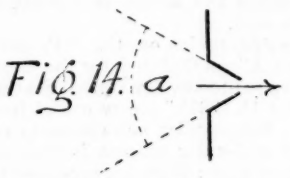
FIG. 13.



When $\frac{d}{D}$ is less than	0·1	C =	0·451
=	0·1	=	0·45
=	0·2	=	0·49
=	0·3	=	0 45
=	0·4	=	0·42
=	0·5	=	0·35
=	0·6	=	0·29
=	0·7	=	0·21
=	0·8	=	0·13
=	0·9	=	0·06
=	1·0	=	0·

Case 3.—Outflow from open space through an angular diminishing opening where a is the angle of opening and when $\frac{d}{D}$ is not less than 0·1:—

FIG. 14.

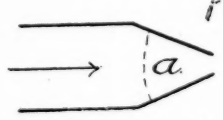


When a =	0°	C =	0·45
=	5°	=	0·11
=	10°	=	0·04
=	20°	=	0·02
=	30°	=	0·00
=	40°	=	0·11
=	50°	=	0·56
=	60°	=	0·73
=	80°	=	0·83
=	100°	=	0·93
=	120°	=	1·04
=	140°	=	1·16
=	160°	=	1·22
=	180°	=	1·366

N.B.—It will be seen that in this case the co-efficients range between those of Case 2, which corresponds with an angular opening whose angle is 0° and Case 1, where the angular opening is 180°

Case 4.—Similar to last, but with the flow from a duct to free space.

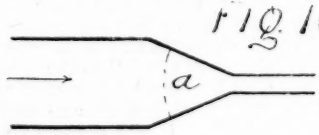
FIG. 15.



When a =	0°	C =	0·0
=	10°	=	0·06
=	20°	=	0·16
=	30°	=	0 26
=	40°	=	0·35
=	60°	=	0 45
=	80°	=	0·49
=	100°	=	0·56
=	120°	=	0·78
=	140°	=	0·88
=	150°	=	0·98
=	160°	=	1·10
=	170°	=	1·23
=	180°	=	1·366

Case 5.—Similar to last, but with the flow from one duct to another of lesser diameter.

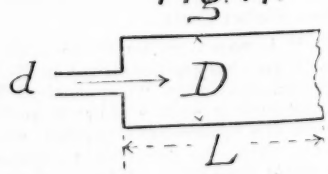
FIG. 10.



When a =	0°	C =	0
=	10°	=	0·13
=	20°	=	0·18
=	30°	=	0·23
=	40°	=	0·29
=	60°	=	0·32
=	80°	=	0 35
=	100°	=	0·38
=	140°	=	0·42
=	180°	=	0·45

Case 6.—Converse of Case 2. Hence there is a gain of power. When the length of greater duct is equal to or more than $6\frac{1}{2}$ (D – d) the co-efficient of increase is as follows:—

FIG. 17.



When $\frac{d}{D}$ =	0·1	C =	0·02
=	0 2	=	0·08
=	0 3	=	0·17
=	0·4	=	0·27
=	0·5	=	0.38
=	0 6	=	0·47
=	0 7	=	0·43
=	0 8	=	0·22
=	0 9	=	0.17
=	1·0	=	0·

Case 7.—Converse of case 5. As in the last when length of larger duct, including the angular enlargement is equal to or more than $6\frac{1}{3}$ (D−*d*), and when the enlargement opens into free space

Fig. 18.

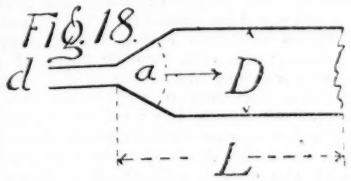
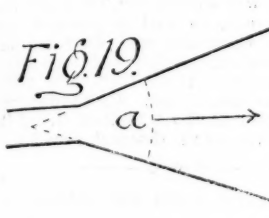


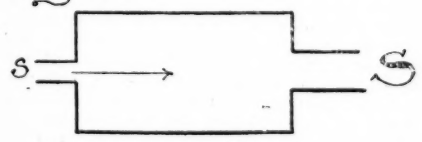
Fig. 19.



When *a* =	0°	C = 0
=	1°	= 0.35
=	2°	= 0.54
=	3°	= 0.66
=	4°	= 0.74
=	5°	= 0.80
=	6°	= 0.83
=	7°	= 0.83
=	8°	= 0.81
=	9°	= 0 67
=	10°	= 0.56
=	12°	= 0.49
=	16°	= 0.45
=	20°	= 0.41
=	25°	= 0.37
=	30°	= 0.28
=	40°	= 0.14
=	50°	= 0.10

Case 8.—Outflow from smaller to larger duct, with enlarged section connecting.

Fig. 20.

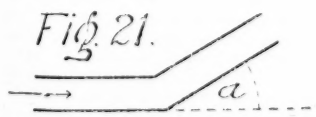


Here the co-efficient $C = \left(\frac{S}{s} - 1\right)^2$ where S is the sectional area of the second duct, and *s* that of the first.

From these tables we see the very important part which change of form or section plays in affecting the pressure necessary to maintain a given velocity. Some of the figures may appear rather astonishing, but the high authority of Péclet's investigations has led to their recognition.

Loss of power results also when the direction of ducts is changed. With a sharp angular change, as in fig. 21, the co-efficient of loss for

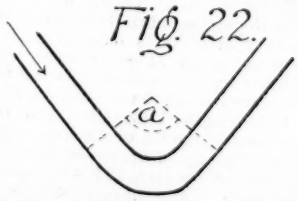
Fig. 21.



angles from 20° to 90°, $C = \text{Sin}^2 a$, therefore with a right-angled break $C = \text{Sin}^2 90° = 1$. The meaning of this will be seen if we work out the value of $\frac{P}{1+C} = p$, which we saw above gives the relation between P, the pressure before the obstruction, and *p*, the pressure after. Therefore with a right-angled turn $\frac{P}{1+1} = p$, and $P = 2p$, that is, half the power is lost by the obstruction caused in a duct thus constructed.

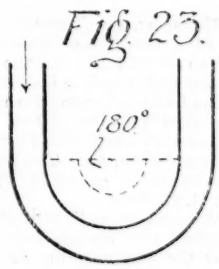
If the angle is rounded, as in fig. 22, instead

Fig. 22.



of being sharp, the evil is less serious; if *a* is the number of degrees in the angle between the ducts, we have for the co-efficient $C = \frac{a}{180}$; thus, for a right-angled turn with rounded angle, $C = \frac{90}{180} = \frac{1}{2}$. Similarly with a semicircular turn, as in fig. 23, $C = \frac{180}{180} = 1$.

Fig. 23.



The loss of power through friction against the sides of channels or ducts has also to be considered. With this we shall continue in the next chapter.

SURVEYORSHIPS.

LLANDUDNO.—The Llandudno Improvement Commissioners met on Saturday last to fill the appointment of Engineer and Surveyor, vacant by the resignation of Mr. Marks, C.E. Mr. E. Paley Stephenson, A.-M. Inst. C.E., of the City Engineer's department, Liverpool, was appointed to the office.

GRIMSBY.—Mr. M. Petree, assistant to Mr. T. de Courcy Meade, M.Inst.C.E., Engineer and Surveyor to the Hornsey Local Board, has been unanimously elected Assistant Borough Surveyor of Grimsby.

OBITUARY.

MR. J. DICK PEDDIE, R.S.A.—We regret to record that this well-known Scotch architect died on the 12th inst., in his 68th year. The *Scotsman* says that his father, the late James Peddie, W.S., of the firm of Messrs. J. & A. Peddie & Ivory, destined him at first for the legal profession; therefore, on completing his education at the Edinburgh University, he spent five years in the study of the law before his natural taste for art asserted itself. Devoting himself then to the study of architecture with all the energy and industry of which he was capable, he quickly raised himself to a foremost place in the profession, and before his term of pupilage had expired, he distinguished himself by defeating the best Scottish architects who sent in competitive designs for the building of Queen-street Hall. This was his first important work, and was soon followed by many others in different parts of Scotland. Cockburn-street, Edinburgh, the construction of which swept away a labyrinth of ugly buildings penetrated by foul and narrow closes, was built from his designs; and among his other notable works (designed by himself or in conjunction with his partner, Mr. C. G. H. Kinnear) were the University Club, Edinburgh; the telling room of the Royal Bank in Edinburgh; the Scottish Provident Institution's Office, Edinburgh; St. Cuthbert's Poorhouse; Chalmers Hospital; the Morgan Hospital, Dundee; the City of Glasgow Insurance Office, Glasgow; the public buildings at Aberdeen; the Sheriff Court-House, Greenock; and the Royal Bank, Glasgow. He entered Parliament as Member for the Kilmarnock Burghs in 1880. We may add that he was the one professional member on the Westminster Hall Commission, and strongly upheld our view with regard to the "restoration" of that building. The funeral took place on Monday last at the Dean Cemetery, Edinburgh.

SIR JOSEPH BAZALGETTE.—We regret to announce the death of Sir Joseph Bazalgette, which occurred on Sunday last at his residence, Wimbledon. According to "Men of the Time," he was born at Enfield, Middlesex, in 1819. At the age of eighteen he was articled as pupil to Sir John MacNeil, C.E. In 1845 he was practising on his own account as engineer in Great George-street. During the railway mania he was very busily engaged in laying out schemes for railways, &c. Retiring from practice in 1847 through ill-health he returned to London in 1848 to accept an appointment as assistant engineer under the then Metropolitan Commission of Sewers. On the death of the Chief Engineer of the Commissioners, in 1852, Mr. Bazalgette was selected from among thirty six candidates to fill the vacant position, being first appointed under the title of General Surveyor of Works, and afterwards as Chief Engineer. On the creation of the Metropolitan Board of Works in 1855-6 he was elected Chief Engineer to that body. His first important work was the carrying out of the Metropolitan Main Drainage system, the works of which were executed between the years 1858 and 1865. The Victoria, Albert, and Chelsea embankments were carried out by him between 1863 and 1874. One of his latest works is the new granite bridge over the Thames at Putney. He resigned his position when the London County Council succeeded the late Metropolitan Board of Works. He was knighted in 1874.

HERR ENDELL.—The head of the architectural department of the Prussian Ministry of Public Works, Herr Oberbaudirektor Endell, died on the 9th instant, after a short but severe illness, at the early age of forty-seven years. Herr Endell was well known in Germany on account of his being one of the very few Government officials who have enjoyed a rapidly successful career. Having but twenty years ago passed his government architect's (Baumeister) examination, he was made a "Bauinspector" in 1876, a "Baurath" in 1879, and a "Geheimer Baurath" and Privy Councillor in 1883; in 1889 he was elected to hold the important post of a "Geheimer Ober-Baurath" and Special Councillor to the Emperor, and in 1890 he held the highest position he could obtain in his department of the Ministry of Public Works, which, as was an open secret, was to be shortly followed by a place in the Cabinet. Outside Germany, Herr Endell was known as editor of the official journal of the Ministry of Public Works, the "Zeitschrift für Bauwesen," and also as editor of the official "Central Blatt der Bauverwaltung" at the time of its formation in 1881 (which latter paper he has always taken great interest in), and some of his work in the formation of building-laws, arrangement of Government building statistics, etc., will be found in technical libraries. His clear judgment and high character obtained for him his success, and these qualities were also the cause of his being one of the most esteemed jurymen at all the great architectural competitions of the last decade.

GENERAL BUILDING NEWS.

RE-OPENING OF THE SOUTH TRANSEPT, ST. BARTHOLOMEW-THE-GREAT, WEST SMITHFIELD.—On the 14th inst. the restored south transept of this church was re-opened by the Bishop of London. The restoration, which has been carried out by Mr. Aston Webb, the architect, has brought to light the remains of much of the old work, which had been hitherto concealed by brick and plaster, and it has also included the addition of one bay, forming a baptistery, with increased seating accommodation.

NEW BATHS, SOUTHAMPTON.—New swimming-baths are in course of erection on the Western Shore, Southampton. The buildings are being constructed of red brickwork, with terra-cotta dressings and enrichments, in the Italian style. The front elevation facing the Western Shore-road is 224 ft. long, with two central towers, 50 ft. high. These towers will be used, one for a smoke-shaft, and the other for the reception of water-tanks, and also for upcast shafts for the purpose of ventilation. The end elevations will be similar, with a total depth of 72 ft. The main front entrances are between the towers, separate for men and women. Internally, the establishment will consist, first of a spacious vestibule, with pay-office in the centre, commanding the approaches to all departments, and also to the existing open swimming-bath at the back, which will be retained. The private baths are ten in number for each sex, placed in the front part of the building, in two saloons 52 ft. by 25 ft., and 16 ft. high, on either side of the vestibule, provided with waiting-rooms, and arranged in first and second classes. The ceilings will be curbed, and formed with zinc sheets, ornamentally perforated for the purpose of ventilation, the space above, between the ceiling and the roof, being directly connected to the upcast shafts in the towers before-mentioned. At the end of each of the saloons space is provided for the Turkish baths. The swimming-baths are two in number, and situated immediately in the rear of the private baths, one for men and one for women, entered from the vestibule by separate entrances. The basins are each 75 ft. long by 30 ft. wide, constructed of Portland cement concrete walls 2 ft. 3 in. thick, and faced with white glazed bricks with tiled platform all round, upon which will be placed dressing-boxes. The baths are to be 3 ft. 3 in. deep at one end, graduating to 6 ft. at the other, and a gallery will be provided at the end for spectators. The platform level of the baths is 7 ft. 3 in. below the level of the vestibule; admission to the baths will, therefore, be by the above galleries, which lead off the vestibules. The roofs are to be constructed of wrought iron, boarded internally, and surmounted by lantern lights, in which will be provided ventilators. The baths will also be lighted by windows at the sides. Under the vestibule a basement is provided, in which will be placed two boilers for raising the temperature of the water in the swimming-baths by the injection of steam, also for supplying hot water to the private baths. The swimming-baths will be filled with salt water by gravitation, the same pipes being used for filling and discharging, and the water will be filtered through a polarite filter, supplied by the International Water and Sewage Purification Company, before entering the baths; both salt and fresh water, hot and cold, will be provided in the slipper-baths. The site of the buildings is protected from the tide by a solid masonry retaining wall, built on a concrete foundation, 3 ft. thick, having an average thickness at the base of 6 ft., and is carried up to a level of

3 ft. above high-water mark spring tides, with a coping 2 ft. 6 in. wide for its entire length, which is over 1,000 ft. By the construction of this retaining wall a considerable area of land has been reclaimed. This land will enable the Corporation to enlarge the establishment when necessary by two additional swimming-baths, but for the present the land is to be laid out as a recreation-ground, with foot-walks and shrubberies. The works have been designed and are carried out under the superintendence of the Borough Surveyor, Mr. W. B. G. Bennett, Assoc. M. Inst. C.E. The cost will be close on 9,000*l.*, and the whole of the works are to be finished by August next. The contractors for the retaining wall and the supply of the iron roofs for the swimming-baths are Messrs. Roe & Co., of Southampton; for the erection of the whole of the buildings, Messrs. Morgan, Isted, & Morgan, of Southampton; and for the heating apparatus, Messrs. Bradford & Co., of Manchester and London, have been recommended by the committee.

ST. ALBANS.—On Thursday, March 12, the Bishop of St. Albans opened the St. Peter's Sunday-schools and Parish-room, the site being given by Earl Spencer. The building contains a large parish-room, 30 ft. by 48 ft., two class-rooms, blanket-room, scullery, &c. The work has been executed by Mr. F. Wise, builder, St. Albans, at a cost of 708*l.*, from the drawings and under the supervision of Mr. F. W. Kinneir Tarte, architect, 36, Furnival-street, Holborn, E.C., and St. Albans.

ST. PAUL'S CHURCH, EDINBURGH.—St. Paul's, York-place, Edinburgh, which was, before the erection of the cathedral, designed by Sir G. G. Scott, the largest church in that city, is to be enlarged by the addition of a chancel. The church stands, as designed by Elliot at the beginning of the century, in the form of a parallelogram with octagonal turrets at each angle. The style is perpendicular, and seems to have been suggested by St. Mary's at Beverley. The west end and aisles are encumbered with heavy galleries which run across the aisle windows, and the organ occupies a portion of the west gallery. It is proposed to remove the galleries and construct a chancel 47 ft. in length, and of the same breadth as the nave. To the south of the chancel will be placed vestries for the clergy and choir, and to the north an organ chamber opening to the chancel with an arch and piers of the same span as those of the nave. The present great east window will occupy a similar position in the chancel, but it will be shortened so as to admit of a reredos being superimposed upon the alter. The flanking turrets will be rebuilt on each side of the window. The alterations will be carried out under the supervision of Messrs. Kinnear & Peddie, architects. To make this church complete architecturally, a tower at the west end (for which there is ample space) is needed. The situation is one where such a feature would appear to great advantage.

NEW CHURCH FOR SWINFORD, CO. MAYO, IRELAND.—On the 15th inst., a new church, which has just been erected at Swinford, co. Mayo, Ireland, was formally dedicated. The building is of the Gothic style of architecture, comprising nave, aisles, side chapels, and sacristy. The total length of the nave is 120 ft. The breadth is 59 ft. The building is of rubble stone, faced with broken ashlar. The dressings are of limestone from the Westport quarries. The building has been erected from the designs and carried out under the superintendence of Mr. William H. Byrne, architect, Dublin, while the building was entrusted to Mr. John Mulligan, of Swinford.

RESTORATION OF YARCOMBE CHURCH.—The restoration of the ancient church at Yarcombe, Devonshire, has just been carried out from plans and specifications prepared by Mr. Charles H. Samson, architect, of Taunton, the general contractor being Mr. Berry, of Honiton. On plan the church consists of a (new) chancel and organ chamber on the north side, nave, north and south aisles, south transept, south-west porch, and embattled western tower. The roof of the chancel is covered in with slates; the old roofs are flat and of lead. All the new doors are of oak, and the windows, old and new, are glazed with plain cathedral glass. Some fragments of Mediæval glass have been preserved in two windows on the north side. During the progress of the restoration an old piscina and a niche, carved and coloured, have been opened out in the south transept. The church rises at both ends. Arcades of four bays each divide the nave from its aisles, and the chancel arch is now opened out. The walls are stuccoed. The roofs are of English oak. The intersections of the timbers are hidden by bosses, some fifteenth-century work, the rest from the chisel of Mr. Harry Hems, of Exeter, who has executed the carving on the new chancel roof, which is also in oak. The floors of the body of the church are laid with wood blocks. The church is seated with open benches, and in the chancel will be stalls of oak.

MINERS' HALL AT NEW BRANCEPETH, NEAR DURHAM.—A new miners' hall, which has been erected at New Brancepeth Colliery by the owners and presented to their workmen, was formally opened on the 14th inst. The sloping nature of the site enables a reading-room, billiard-room, smoke-room, and store-room to be provided on the basement, level with the road. Above is a hall, capable of seating 500 persons, including a gallery at the end. The entrance to the hall is at the upper part of the site, level with the pavement, and in connexion with it are cloak-rooms, ladies' and gentlemen's retiring-rooms, with the usual accessories. The heating is by means of Musgrave's hot-air stoves, supplied by Messrs. Emley & Sons. The buildings are erected with pressed bricks and stone dressings, in the Renaissance style, from designs prepared by Mr. J. W. Taylor, architect, of Newcastle. The cost of the premises will be about 1,400*l.*

NEW FEVER HOSPITAL AT CLECKHEATON.—The memorial-stone of a new Fever Hospital for the North Bierley district was laid on the 14th inst. The site of the new building is in Oakenshaw-road, Cleckheaten. The buildings comprise an administrative block, a ward pavilion of two wards and twelve beds, an isolation block with four wards and ten beds, and a wash-house, &c. The plans for the new hospital have been prepared by Mr. W. Langley and Mr. G. C. Ross.

NEW FREE CHURCH FOR EDINBURGH. — The plans of the proposed new church, hall, and offices to be erected by the congregation of Warrender Park Free Church, Edinburgh, have just been approved by the Dean of Guild Court. The site of the buildings is at the corner of Greenhill-gardens and Whitehouse-loan. The plans show a church measuring internally 80 ft. by 40 ft., and having galleries running round three sides, and giving in all an accommodation of over 800 sittings. The hall gives accommodation for 200 sittings. Grouped in plan with the hall is the committee-room and vestry. The church proper is entered from a hall, from which start two stone gallery staircases, while there is a retiring-room with lavatory accommodation attached. The main entrance door is shown in elevation towards Whitehouse-loan, while two exit doors are shown in elevation towards Greenhill-gardens. The style of architecture adopted in the treatment of the elevations is an adaptation of Italian Renaissance of the sixteenth century. The architect is Mr. R. A. Cameron, of Edinburgh, whose plans were accepted recently in competition. The cost of the whole work is estimated at 5,000*l.*

A PROPOSED NEW MUSIC-HALL FOR EDINBURGH. —A company has been formed, under the title of the Edinburgh Empire Palace Company, to establish a new variety music-hall in the south side of the city. The plans for the new structure, which have been prepared by Mr. Matcham, architect, London, show a building capable of accommodating 3,000 persons, and lighted by electricity. The outer walls of the present circus, which stands on the site of the proposed new theatre, will be retained, and it is anticipated that the building can be erected for about 12,000*l.*

NEW HALL, CRUMPSALL.—The Bishop of Manchester on the 11th inst. formally opened St. Mary's Hall, Crumpsall, a building which has been built near St. Mary's Church to serve a variety of parochial purposes. The building has been constructed from the plans of Mr. Thomas Muirhead, architect, of Manchester, at a cost of over 3,000*l.*

THE ALTAR SCREEN OF WINCHESTER CATHEDRAL. —The work of restoring the altar screen of Winchester Cathedral, begun six years ago by Dean Kitchin, has just been completed. This addition to the cathedral was erected in the last part of the fifteenth century by Bishop Fox, and its niches were filled with nineteen large and thirty-eight small statues, till they were demolished in the time of Queen Elizabeth. The sculptors for the new work were Mr. Nicholls, who designed eight figures (those immediately over the altar), Mr. Geflowski ten, Miss Grant two, Messrs. Farmer & Brindley one, and the remaining thirty-six have been executed by Mr. Boulton, of Cheltenham, under the supervision of Mr. C. E. Buckler. Fifty-six statues now enrich the screen, and the work of restoration has been completed at a total cost of 5,400*l.*

A NEW CONGREGATIONAL CHURCH AT BRADFORD.—A new Congregational Church in Aireville-road, Frizinghall, Bradford, was opened on the 10th inst. by the Rev. John Hunter, of Glasgow. The new structure, which has accommodation for about 450 persons, is in the Gothic style of architecture. The centre gable is flanked with the tower and spire, rising to a height of 100 ft., and on the other side by the staircase gable. Internally the church comprises nave, transept, and chancel, with gallery at the back, the floor of the chancel being paved with marble. The seating is in pitch pine, whilst the pulpit is of oak. The roof is open-timbered, and the windows are filled in with leaded lights. Mr. H. Isitt was the architect.

SANITARY AND ENGINEERING NEWS.

EDINBURGH AND THE HORNSEY "DESTRUCTOR." —On Saturday last the Lord Provost of Edinburgh, accompanied by some members of the Town Council, together with the Dean of Faculty, the Town Clerk, and other officials, paid a visit to the new sanitary depôt of the Hornsey Local Board, where they were received by the Chairman of the Board, Mr. H. R. Williams, and Mr. de Courcy Meade, M.Inst.C.E., the Board's Engineer, by whom they were conducted over the various buildings, the greatest attention being concentrated upon the works connected with the dust destructor, which underwent a very minute examination. In the course of the visit the Lord Provost stated that for years past the whole of the house-refuse of Edinburgh had been sent to the farmers, who till lately had willingly received it, but they now declined to take any more, and the Corporation were consequently placed in great difficulty with a large accumulation of dust with which they must deal somehow. Mr. Meade explained the process through which the dust passed from the time of its delivery till its withdrawal from the furnaces as clinker. During the visit two or three of the furnaces were drawn; the visitors, therefore, had not only the opportunity of seeing the furnaces filled, but of witnessing the final transformation into a hard substance as clinker, which appears to be much in demand. After expressing their satisfaction with the orderly and effective manner in which the work was carried out, the Lord Provost tendered his thanks, as well as those of his colleagues, to the Chairman and Engineer of the Board, for the courtesy which had been extended to them, and assured them that their visit had given them great satisfaction. On the day previous a deputation from the Toxteth Park Local Board, near Liverpool, visited the destructor works.

FOREIGN AND COLONIAL.

FRANCE.—The Municipal Council of Paris has voted 2,000 francs towards the proposed monument to Meissonier.——M. Alphand has been appointed to succeed the late Baron Haussmann at the Académie des Beaux Arts.——The Société des Peintres-Graveurs, of which M. Bracquemond is the president, has been formally and officially constituted.——The Minister of Commerce will apply shortly for the necessary vote for the participation of France in the Chicago exhibition.——The Chamber of Deputies has under consideration a concession to the Orleans Railway Company for various new lines of a total length of 730 kilomètres.——In spite of many protests from artists and archæologists, the Government has authorised the destruction of the Port de France at Belfort, dating from the time of Vauban, on the ground that it obstructs the traffic between the old town and the new suburbs.——The church of Colombes is undergoing restoration. It belongs to three distinct epochs, and presents a curious mixture of Romanesque, Gothic, and Renaissance work. The clock-tower, which dates from the eleventh century, is in a ruinous state.——The Mairo of Lille has come to Paris to consider the project for the monument to General Faidherbe to be executed by M. Mercié. The design consists of an equestrian statue on a high pedestal decorated with figures symbolising France, Africa, and the principal towns of the north.——A subscription committee has been formed at Frontignan to erect a bust there to the memory of the painter Sebastien Bourdon, born in 1616, and who died in 1676.——The town of Capel-Biron, where Bernard Palissy was born, has asked the Paris Municipality for authority to execute a reproduction of the bronze statue of the artist in the Square St. Germain, the work of Barrias.——The French architects have been invited to take part in a competition for the erection at Para, in Brazil, of a monument commemorating the proclamation of the Brazilian Republic.——At the Galérie Durand-Ruel in Paris an exhibition has been opened of the works of the painter Eugène Boudin.——A fine-art exhibition is to be opened at Nantes on April 4, to close on May 4.——An exhibition of painting, sculpture, and architecture is to be opened at Nimes on May 1. ——A fine-art exhibition is to be opened at Avignon, at the Hôtel de Ville, on May 9. ——A collection of tombs of the Merovingian epoch has been discovered at Bouillard. Skeletons, vases, medals, and silver ornaments have been found there.——A small farmer at Loiret has discovered, in preparing the foundations for a building, an antique fragment, the torso of a female statue, somewhat resembling the similar fragment found near Poitiers in 1876, and now in the Louvre.——The competition for the building of "Salles des Malades" in the garden of the hospital at Compiègne has just been decided. The first premium is awarded to MM. Bourdilliat and Colombier, of Paris, the second to M. Marcel, of Paris, and the third to M. Stra, of Compiègne.——The committee for the decoration of the Hôtel de Ville, of Paris, has proposed to the Municipal Council the name of M. Emile Barran, as successor to the late M. John Lewis Brown, who left uncompleted his panel intended for the decoration of the Salon des Sciences.

BERLIN.—The annual "Schinkel Celebration" was held under the auspices of the Architekten Verein zu Berlin on the 13th inst., when Professor Hauck, of the Royal Technical College, read a paper on "the career and duties of a constructor," in which discourse many allusions were made to Goethe's opinion on the subject. At the banquet following this first part of the celebration, Professor Reuleaux, Geheimrath Tungnickel, and Baurath Blankenstein headed the list of speakers. According to the annual report of the Architekten Verein, this society has at present 594 town and 1,923 country members. Its library counts 11,700 volumes. The Emperor has bought a portrait of Dr. Schliemann, painted by Mr. Sydney Hodges, and

has presented it to the "Museum für Voelkerkunde," in which the collections given by the deceased to the German Government are being kept at present. At the Royal Technical College, the celebration of unveiling two busts of the deceased Professors Spielberg and Winkler, took place on the 11th inst. Professor Wolf, of the architectural division, made a memorial speech on the decorative artist Spielberg, and Professor Goering, of the engineering division, described the life and work of his deceased colleague Winkler. Professor Reuleaux, the Rector, before unveiling the busts (executed by the late Professor Luerssen), gave an address to the students.——According to official statistics, 5,362 persons have been enjoying the benefit of technical education at the new technical colleges of the German Empire during the winter 1890–91; of these, 830 belonged to the architectural divisions. ——A monument to the deceased Empress Augusta is to be erected in Berlin, and Professor Herter has been invited to execute the sculpture. The Professor's idea (which can be seen in form of a model) is to place the bust of the Empress on a high pedestal, at the base of which are placed, on the one side, a woman nursing a child, and, on the other, a veteran pensioner pointing out the bust to a lad standing at his side,—both these side groups referring to the deceased's benevolence, firstly, to children's hospitals, and, secondly, to the Red Cross Society working under her patronage.

DENMARK.—The fund for the building of a new Industrial Art Museum in Copenhagen is progressing satisfactorily, a considerable sum having already come in, besides gifts of exhibits.——The great Blegedam Hospital in Copenhagen has been considerably enlarged and improved during the last two years, at a cost of 20,000*l.*, the architect being Professor Feuger.——The Copenhagen Municipality has acquired an excellent site for the new Central Electrical Station, at a cost of about 20,000*l.* The station is intended to supply 39,000 glow-lamps.——The great new railway station at Elsinore, on the Sound, through which passes the entire traffic from and to Sweden and Norway, has now been completed. The style is Gothic Renaissance, the material used being red bricks, with a basement of polished granite, 10 ft. in height. The building stands on about 2,000 wooden piles. All ornamentations, door and window frames, &c., are of sandstone from the island Oland. The roof and towers are covered alternately with slates, copper, and lead. The front elevation has a length of 155 ft., that of the two wings being 140 feet each. Over the main entrance, borne by six columns of red polished granite, rise two towers, having a height of 110 ft. The platforms are 580 ft. in length. A post and telegraph office is to be added in the same style and of similar material. The cost of the undertaking will be about 120,000*l.* The architect is Herr Mynster, of Copenhagen.——The building of the great so-called "Marble Cathedral" in Copenhagen, upon which work has been going on for many years, is progressing, although slowly from want of the necessary grants. The great statues of biblical personages which are to ornament the frontage have just been mounted. They are 15 ft. in height, weigh 1,600 lbs., and are cast of zinc in Copenhagen.

TOKIO.—Last Saturday's *Deutsche Bauzeitung* publishes some interesting drawings of work pertaining to the erection of the new Houses of Parliament at Tokio, the architects being Messrs. Ende & Boeckmann, of Berlin. According to this publication, in which we see, besides the design of the provisional building which had but so short a life of five weeks (burnt down owing to accident to an electric wire, January 19), the drawings of the preliminary design for the proposed monumental erection, in Renaissance style and crowned by a cupola of large dimensions, and also the elevation for a second design, in which a combination of Renaissance masonry surmounted by wooden roofs of old Japanese form has been adopted. The plan keeps Upper House and Lower House, with their assembly-rooms, lobbies, refreshment and reading-rooms, separate from one another at the opposite extremities of the building, the connecting link between these two independent parts being in the form of two fine "salles des pas perdues," and a top-lighted central staircase with the royal vestibule and waiting-rooms attached, which are also connected to the two "Houses" by a special corridor off which a set of small committee rooms and private rooms open. The block, as a whole, shows a frontage of some 180 mètres to a depth of some 70 mètres; the two assembly halls are about 22 to 28 mètres, and the total length of the two "salles des pas perdues" is nearly 100 mètres. As to cost nothing is said. The Japanese Government are now doing the work themselves after political troubles had caused them to abandon the idea of having the block erected entirely under the superintendence of Messrs. Ende and Boeckmann and their foreign staff. Herr Boeckmann spent 1886 in Japan; his partner also spent some time in the country during 1887.

GRANOLITHIC PAVING COMPANY.—The directors of Stuart's Granolithic Paving Company, Limited, at a meeting held in their London office on the 11th inst., recommended a dividend of 10 per cent. for the past year, exclusive of their French and Australian business.

MISCELLANEOUS.

SOUTH LONDON POLYTECHNIC INSTITUTES.—The Committee of the South London Polytechnics have appointed Professor Garnett, the well-known Principal of the Durham College of Science, Newcastle-upon-Tyne, as their consulting specialist to confer with their two architects, Mr. Rowland Plumbe, F.R.I.B.A., for the Borough-road Institute, and the gentleman whose design is selected for the building at Battersea, upon the internal arrangements and technical requirements of these two important buildings.

THE EDUCATION AND REGISTRATION OF PLUMBERS.—Mr. John Holden, F.R.I.B.A., presided at a public meeting held under the auspices of the Manchester District Council for the National Registration of Plumbers, in the Technical School, Manchester, on 11th inst., and delivered an address on "Plumbing, Past and Present." At the same meeting, Mr. Wm. Jaffray read a paper on "The General Practice of Plumbing," in which he strongly condemned the use of a two-gallon flush in any form of water-closet.——A largely-attended public meeting in furtherance of the movement for the national registration of plumbers was held in the Town-hall, Newport, on the 13th inst. In the unavoidable absence of the Mayor, the Ex-Mayor (Mr. Mordey) presided, and among the gentlemen on the platform were Mr. E. Seward, F.R.I.B.A., President of the District Council; Mr. Councillor H. L. Carr, Vice-president; Mr. L. B. Moore, Mr. Fawckner (architect), Mr. Swash (architect), Dr. Davies, and Dr. Thomas. A resolution in support of the movement was carried unanimously.——The Prince of Wales presided on Monday afternoon at a meeting of the Organising Committee of the International Congress of Hygiene and Demography to be held in London in August next. The Lord Provost of Edinburgh was among those present, and supported the adoption of the Committee's report, including an arrangement for a special meeting of the Congress to consider "The National Education and Registration of Plumbers in relation to the Public Health."

ELECTRIC LIGHTING AT THE NATIONAL SPORTING CLUB.—The electric light installation at the premises of the National Sporting Club has been carried out by Messrs. Henry F. Joel & Co., of London. There are at present about 160 lights, but provision is made for extension to 300 lights. The fittings have been specially designed and adapted to assimilate with the general design of the building. In the theatre they follow the curves of the arches, lighting up the arena and also the decorated ceiling. Switches are fitted to turn any of the groups of the lights "off" or "on," and all the lights are under control in the porter's box at the entrance. Special switches, with detachable handles, are fitted in the billiard-room. The electric current is supplied by the Metropolitan Electric Light Co., and when the circuits were recently tested they gave an insulation resistance of over 5,000,000 ohms (more than ten times the required test). All the work has been carried out in accordance with the Fire Insurance Co.'s rules. There are some miles of insulated wire laid down, and many thousand feet of casings all painted with asbestos paint.

THE ENGLISH IRON TRADE.—The English iron market is still exceedingly quiet for the time of year, and business is dragging, being almost entirely restricted to immediate requirements, which are met by second-hand holders, while prices are beaten down by buyers, so much so that makers declare they would be losing money if they acceded to rates offered by consumers. The question of a reduction of wages is consequently coming to the front, employers having given notices to that effect. In the pig-iron market the putting in blast of Scotch furnaces has had the effect of further depreciating values. Prices of warrants are tending lower, and makers' iron is following the same course. In finished iron not much is being done, but rates, owing to the inability of manufacturers to continue selling at a loss, are still fairly well maintained, though weaker. There is a slightly better tone in steel. Large rail orders are in the market, and shipbuilders are buying somewhat more freely. On the whole, the latter continue fairly well, and in some cases briskly engaged; but engineers are beginning to feel the effects of a slacker demand.—*Iron.*

NEW SOUTH WALES.—We have received from the Agent-General for New South Wales the year book of the colony for 1891, issued by the New South Wales Government,* which contains a great deal of information as to the country; historical, commercial, and geographical.

THE ZONE TARIFF FOR RAILWAYS.—The adoption of the zone tariff on the Uddevalla-Venersborg-Herrljunga Railway, in Sweden,—the first one to adopt the system in that country,—has been attended with great success. The former fares were 4 öre (½d.) third, and 7 öre (1d.) second-class per kilomètre,—there being no first-class,—as against 25 öre (3d.) and 50 öre (6d.), at present per zone of 12 kilomètres; and during the first five months of the working of the system 11,158 second, and 80,057 third-class travellers were carried, the receipts amounting to 3,260*l.* In the corresponding period of 1889 the travellers numbered respectively 8,311 and 56,665, whilst the earnings were 3,100*l.* Thus, the increase of travellers is 26,239, and of earnings 160*l.* The current expenditure has not increased. A motion is before Parliament for the adoption of the system on the State railways with certain modifications.

THE SWEDISH COAL, CLAY, AND MARBLE INDUSTRIES.—Coals are only found in Sweden in one province, viz., that of Scania, the southernmost end of the kind termed lignite. However, the beds are of great extent and value, although the coals cannot be used in the iron industry, partly on account of their nature and more particularly on account of the great distance between the coalfields and the ironworks, entailing a too costly transport. But the coals are largely used on the State and private railways in the South of Sweden, the engines having been fitted with grates adapted to their consumption. The price at the pit's mouth is generally for best quality 1s. 4d. per hectolitre. The largest coal company is the Kropp Company which boasts a village on its property,—a rare occurrence in Sweden,—inhabited by its employés, with excellent sanitary arrangements, a school, a church, &c.

THE SWEDISH IRON AND STEEL INDUSTRY.—From the report just issued of the Swedish iron and steel industry in 1889, we learn that 393 mines were worked, whence were raised 983,600 tons of iron ore, as against 485 mines and 937,000 tons in 1888. In blast were 150 furnaces, turning out 420,700 tons of pig-iron, as against 162 and 444,000 respectively in 1888. The largest output from one works was 26,700 tons, or an average of 23·8 tons a day. As regards the bar-iron industry we find 181 works with 473 hearths engaged in the same, turning out 274,400 tons, as against 186 works, 525 hearths, and 248,000 tons in 1888. Of the former quantity 40,200 tons of bars were manufactured by the Bessemer, and 33,600 tons by the Martin process. The manufacture of steel in Sweden shows enormous progress of late years, although the increase in 1887-88 was but slight, viz., about 3,500 tons. But in 1888-89 the output was no less than 27,000 tons more than in the preceding year.

THE "SHAW" REFLECTOR GAS LIGHT.—This is a patent by Mr. Joseph Shaw (of Lockwood, Huddersfield) for applying reflectors above pendant gas lights, in such a manner as to be applicable to existing gas lights in residences. The reflector forms a wide shallow hood of inverted saucer shape, over the lights. It may be made decorative in appearance (we cannot say that the published patterns are so), and seems calculated to give a pleasing diffused light reflected downwards on the room, and probably would admit of some saving of gas, as well as the sanitary advantage of burning less gas and heating the air less. It appears to us that it would be possible with this reflector to mask the direct light from the gas jet altogether, and thus do away with the unpleasant glare of gas. The patentee does not suggest this in his circular, however.

THE DUKE OF WELLINGTON'S RIDING SCHOOL AND STABLES AT KNIGHTSBRIDGE.—This important freehold property, which occupies an exceptionally fine position near Albert-gate, extending from Knightsbridge High-road to Hyde Park, was sold by auction at the Mart, on Tuesday last, under instructions from the Duke, by Messrs. Debenham, Tewson, Farmer, & Bridgewater, for 60,000*l.* after brisk competition. The property covers an area of 16,900 square ft., and has three frontages—viz., about 86 ft. to Hyde Park, 84 ft. to the Knightsbridge-road, and 126 ft. to Park-place.

A CHIMNEY STACK 460 FT. HIGH.—The *Zeitschrift* of the Society of German Engineers contains a description of a high chimney recently erected at the Halsbrückner Hütte, near Freiberg, Saxony. It serves at present for carrying off the obnoxious gases of the calcining furnaces and the blast furnaces, but a connexion is to be made also with the reverberatory furnaces of the works. As the Halsbrücken works are situate in the deep valley of the Mulde, the top of the old chimney stack does not reach to the summits of the surrounding heights. Consequently, at times the smoke from the furnaces lay like a blanket over the neighbouring fields. To remedy this state of things the present chimney stack was designed and erected, its top reaching 138 ft. above the highest summit near. At its base the chimney has a diameter of 33 ft., at its top 16 ft., its inner diameter being 8 ft. It is built throughout of massive claystone, with a facing of markstone at its base. For ascending the stack during building and afterwards, climbing irons of rod iron 1 in. thick have been inserted outside and inside. They enter the masonry to a depth of 5¾ in., and are, besides, provided with grapple hooks. To carry the gases from the old chimney to the new it was necessary to construct a flue to the new one, partly of wood covered inside with lead, partly of brickwork. This proved rather expensive, and brought the total cost of the chimney up to 6,500*l.* The Freiberg chimney is the highest in the world, the next highest being that at Messrs. Townsend's works, Port Dundas, Glasgow, which is 454 ft. high.

* To be obtained through the New South Wales Agency, 9 Victoria street.

COMPETITIONS, CONTRACTS, AND PUBLIC APPOINTMENTS.

COMPETITIONS.

Nature of Work.	By whom Advertised	Premium.	Designs to be delivered.
*Labourers' Dwellings	Manchester Corp.	Oldhaw-rd. Area, 100*l.* 50*l.* 25*l.*; Pollard-st. Area, 30*l.* 20*l.*	June 1
*Alterations and Additions to Town Hall	Kendal Corporation	30*l.* 20*l.* 10*l.*	No date

CONTRACTS.

Nature of Work or Materials.	By whom Required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.
*Painting Works	Brighton Town Coun.	F. J. C. May	Mar. 23
*Making-up Roads and Paving Footways	Willesden Local Bd.	O. Claude Robson	Mar. 24
Main Drainage Works (three contracts)	Queensbury Loc. Bd.	John Drake	do.
Farm Steading, Blackfolds, Wester Elchies, N.B.	Cameron & Allan	.....	do.
Waterworks, Nairn	.....	Gordon & McBey	do.
Lead Pipes, &c.	Plymouth Corp.	G. D. Bellamy	do.
Gas Fittings, Infirmary Buildings	Belfast Union	Young & Mackenzie	do.
Road Metal	Stirlingshire C. C.	W. Paul	do.
*Removal of House Refuse	St. Pancras Vestry	*Official*	do.
Dwelling-house, Market Rasen	Dr. G. H. Barton	W. Watkins	Mar. 25
Main Sewer, Ravensthorpe	Brixworth R.S.A.	*Official*	do.
Sinking an Artesian Well	Aston Manor Loc. Bd.	W. A. Davies	do.
Alterations to Methodist Manse, Donaghadee, Ireland	Rev. Irvine Johnson	J. J. Phillips	do.
Broken Granite and Paving Bricks	Fenton Local Board	S. A. Goodall	do.
*Underground Convenience	St. Martins-in-the-Flds Vestry	C. Mason	do.
*Barge-away Dust, Ashes, Refuse, &c.	Hammersmith Vestry	H. Mair	do.
*Widening Road	Horbury Local Board	H. P. Dawson	Mar. 26
Shops and Outbuildings	Treharris Co-op. Soc. Lim.	.....	do.
*Cleaning and Painting Lamps, Pillars, &c.	Brighton Town Coun.	F. J. C. May	Mar. 27
Rowley Rag Stone, Pipes, &c.	Smethwick Local Bd.	J. C. Stuart	do.
Five Cottages, Treorky, Treherbert	D. Williams	.....	do.
Gasholder Tank and Boundary Wall	Bothwell & Uddingston Gas Co. Lim.	L. Hislop	Mar. 28
Road Materials	Kingscliffe High. Bd.	*Official*	do.
Road Metal	Durham County Coun.	do.	do.
Keinton Stone, Paving, Kerbing, and Water Table	Yeovil Corporation	W. Armytage	Mar. 30
Flint Road Metal	do.	do.	do.
Waterworks	Kirkcaldy and Dysart Waterworks Com.	W. D. Sang	Mar. 31
Removal of Rock under Water	Wisk and Pulteney Harbour Trustees	James Barron	do.
Sewerage Works, South Moor	Lanchester U.R.S.A.	J. E. Parker	April 1
Alterations and Additions to Church, Crossmolina, co. Mayo	V. Rev. John Conmey	W. H. Byrne	do.
Concrete Retaining Wall	Hurworth Burial, &c. Committee	*Official*	do.
*Works and Materials	Finchley Local Board	do.	do.
*Fire Escape Staircases at Workhouse	West Ham Union	F. J. Sturdy	do.
Farm Steadings, Burnside, Turriff, N.B.	.....	Jas. Duncan	do.
*Sewerage Works	East Grinstead R.S.A.	Urban Smith	do.
Additions to School	Cheslyn Hay & Great Wyrley School Board	J. Greensill	April 2

CONTRACTS.—*Continued.*

Nature of Work or Materials.	By whom Required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.
Supply of Timber	G. W. R. Co.	*Official*	April 2
*Works and Materials (Liverpool Sub-District)	War Department	do.	April 3
Waterworks	Rothesay Town Coun.	Leslie & Reid	do.
*Works and Materials	Southgate Local Bd.	C. G. Lawson	do.
Main Sewerage Works	Houghton-le-Spring Local Board	D. Balfour	April 5
Thirty-six Houses, Ty'r Arlwydd, Mountain Ash (Glam.)	Building Club	.....	do.
*Raising Building and Constructing Concrete Floor and Roof	Sheffield United Gas Light Co.	F. W. Stevenson	April 6
Four Lancashire Steel Boilers, Cast-iron Columns, &c.	do.	do.	do.
*Stone Kerbing	New Malden Loc. Bd.	T. V. H. Davison	do.
Cast-iron Socket Pipes (six miles)	Shipley Local Bd.	W. B. Woodhead & Son	do.
New Banking Premises, Pudsey and Morley	Yorkshire Banking Co.	F. W. Masters	April 8
Sheds and other Structures, Belfast	N. E. Agricultural Assoc. of Ireland	Wm. Hastings	April 9
Waterworks	Dungarvan Twn Com.	*Official*	do.
*Painting and Cleansing Works	Fulham Bd. of Guar.	*Official*	April 10
*Cemetery, Chapel, Lodge, &c. &c.	Melton Mowbray L. B.	do.	do.
Water Supply Works	Swansea U.R.S.A.	John Thomas	April 11
Socket Pipes, Sluice Valves, and Hydrants	do.	do.	do.
*Works and Materials	Strand Bd. of Works	*Official*	April 15
*Construction of Storage Reservoir, &c.	Bristol Water Co.	T. & C. Hawksley	April 30
*Road Works	Newtown (N. Wales) Local Board	*Official*	No date
Villa, Roundhay-road, Leeds	.....	Hutton & Sons	do.
Boundary Walls, &c. Church, Camerton, Workington	.....	G. Dale Oliver	do.
Church, Newfield, Byers Green, Durham	.....	J. W. Taylor	do.
Additions to Schools, Elworth, Sandbach, Cheshire	.....	Chapman & Snape	do.
Number of Small Houses, Armley, Leeds	Ellison Bros.	.....	do.
Foundation Work, Spence-lane, Holbeck	C. & E. Roberts	.....	do.
Warehouse, Armley, Leeds	Lutas Leathley	.....	do.
Alterations to Premises, Armagh	.....	Wm. Couser	do.
Training College, Norwich	Rev. T. Archbold	.....	do.
Chapel and School, Bentley, nr. Doncaster	.....	C. J. Innocent	do.
Iron Retort Work	Pumpherston (Glas.) Oil Co. Lim.	.....	do.
Warehouse, St Paul-street, Leeds	.....	Thos. Ambler	do.
Five Houses, Woodlesford, nr. Leeds	.....	R. J. Smith	do.
Additions and Alterations to Highfield, Horsforth	.....	Fairbank & Wall	do.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary	Applications to be in
*Road Foreman	Birmingham Corportn	2*l.*	Mar. 23
*Inspectors (2) of Sanitary Works	Commissnrs. of Sewers	200*l.* &c. each	April 2
*Clerk of Works	Islington Vestry	4*l.* week	April 6
*Surveyor and Assistant Surveyor	Condover District Highway Board	150*l.* and 80*l.*	April 7

Those marked with an Asterisk (*) are advertised in this Number. *Competitions, p.* iv. *Contracts, pp.* iv., vi., *and* viii. *Public Appointments, p.* xxi.

MEETINGS.

SATURDAY, MARCH 21.

St. Paul's Ecclesiological Society.—Visit to the Church of Holy Trinity, Chelsea.—Members meet at the Church at 3.30 p.m.

Royal Institution.—The Right Hon. Lord Rayleigh, M.A., F.R.S., on "The Forces of Cohesion." VI.

Edinburgh Architectural Association. — Visit to Gosford House, and Red House.

Glasgow Architectural Association.—Visit to Paisley, Coats Church, &c.

MONDAY, MARCH 23.

Royal Institute of British Architects.—(1) Mr. George Simonds on "Some Aspects of Sculpture in Relation to Architecture." (2) Mr. Arthur T. Bolton on "Mosaics." 8 p.m.

Society of Arts (Cantor Lectures).—Professor R. Meldola, F.R.S., on "Photographic Chemistry." III. 8 p.m.

TUESDAY, MARCH 24.

Institution of Civil Engineers.—Mr. W. T. H. Carrington on "The Reception and Storage of Petroleum Oil in Bulk." 8 p.m.

Society of Arts (Applied Art Section).—Mr. Clement Heaton on "Uses of Cloisonné for Decoration in Ancient and Modern Times." 8 p.m.

Sanitary Institute (Lectures for Sanitary Officers).—Mr. A. Wynter Blyth on "Sanitary Laws and Regulations Governing the Metropolis." 8 p.m.

RECENT PATENTS:

ABSTRACTS OF SPECIFICATIONS.

2,223 and 2,224.—GLASS-ROOFING: *J. E. Rendle.*—According to this invention, no cement or putty is used; the glass is placed on purlins, about 2 ft. 6 in. to 3 ft. apart. The upper portion is placed into wood, grooved out so as to receive it, and the lower portion is secured by metal hooks or clips, fastened to the purlins. A strip of thin lead, of I section, is inserted between the vertical edges of the glass, these being placed in the spaces on each side of the cross-bar, the halves of the I strip being folded against each other, and the upper parts pressed down tightly on the glass. The pane below rests on the purlin, extending about 1½ in. underneath the clips, making a good lap. The ends of the roof are finished off by means of a channelled or grooved wooden bar, which receives the edges of the glass and is covered with flashing.

3,985.—BRICK AND TILE KILNS: *G. Möller.*—In the furnace or kiln to which this specification refers, horizontal channels extend from the bottom of each of the several chambers, to a vertical channel; a removable pipe connects this with the flue common to all the chambers, and leads to the chimney outside the kiln. Special facilities are devised for effectually closing the orifices by lids, luting, &c.

4,738.—SASH AND FRAME: *S. Haslam.*—This invention proposes to effect an improvement on the ordinary sash window by means of pivots fixed at the bottom of either sash. The sashes can be let down at right angles so that the outside of the window may be more easily cleaned.

4,504—BRICK KILNS: *E. P. Lee.*—By this invention a culvert or flue, common to a series of two or more kilns, is provided, the communication between the kilns and flue being controlled at will. Special provision is also made for conveying off moisture from the goods, and it is claimed that the direction, distribution, and intensity of the heat in the kilns is under more complete control.

4,900.—CHIMNEY-POTS, VENTILATORS, &C.: *R. Roberts.*—The exterior of the pot, &c., which is the subject of his patent is provided with a collar, lip, or ledge, with a number of wing pieces or brackets upon which the wind impinges and causes an up-draught, and at the same time prevents down-draught.

11,377.—CLEANSING DRAINS, &C.: *J. C. Merryweather.*—To remove the accumulation of solid matter which resists the action of ordinary flushing, it is proposed by this invention to employ a flexible india-rubber pipe with metallic nozzles placed radially at intervals. Any liquid or disinfectant is thus delivered with great force, and effects a thorough cleansing.

11,893.—WINDOWS: *A. & W. Fitton.*—According to the specification, four cog-wheels work in a rack in such a manner that the weight of one sash is the support of the other in any position; as one sash is drawn down the other goes up.

17,616.—RAISING AND LOWERING WEIGHTS: *P. Mitchell.*—It is proposed to use a lifting-chain, the links of which are constructed with peculiarly-shaped teeth, the chain being passed over a suitably-formed sheave or pulley, carried in a suitable block frame, or stirrup. In connexion with the frame is mounted a lever carrying a pawl or catch, adapted to engage with the teeth of the chain in such a manner that when the lever is depressed the weight will be raised. A catch is provided for holding the chain during the time that the lever is being moved back ready for the next lift.

NEW APPLICATIONS FOR PATENTS.

March 2.—3,693, T. Messenger, Lock-latch and Fittings for doors hung vertically.—3,724, R. Hermanns, Constructing Stairways.—3,734, P. Bright, Lavatory Basins, &c.—3,747, H. Snell, Water-closets, Baths, and Lavatories.

March 3.—3,763, C. Zander, Self-locking Apparatus for doors, windows, &c.—3,797, G. Skelsey, Portland Cement.—3,801, C. Jackson, Register Stove.—3,821, W. Thompson, Carving Machines.—3,832, J. Noad, White Lead.—3,833, H. Sturm, Hollow Tiles.

March 4.—3,877, C. Green, Window Ventilation.—3,884, W. Bendall, Bearing Bar attachments for Paint Pots, &c.—3,908, J. Lewis, Fire-places.

March 5.—3,964, T. Crapper, Automatically Flushing Water-closets.—3,966, A. Fulcher, and H. Loosemore, Ventilators and Ventilating Cowls.—3,971, J. Piccaver, Fastener for Doors, Windows, &c.—3,989, A. Boult, Open Fire-place Grates. — 3,991, G. Taylor, Chimney Cowls.

March 6. — 4,006, T. Hughes, Draught and Rain Excluder for Doors and Windows.—4,014, W. Devoll, Siphons for Flushing Cisterns.—4,016, R. Clayton, Nails.

March 7.—4,102, A. Morison, Locks, Latches for Water-closet Doors, &c.—4,106, W. Hartridge, Preventing the Escape of Smoke from Chimneys.—4,116, W. Cooper, Kilns or Sheds for Drying Bricks, &c.

PROVISIONAL SPECIFICATIONS ACCEPTED.

82, G. Haskins, Spring for Raising Water-closet Seats.—725, R. Wunsch, Bridges.—937, E. and E. Atkins, Attaching Electrical Wires to Ceiling Roses.—1,471, J. Henderson, Window Frames and Sashes.—1,852, G. Clark and others, Water-closets and Flushing same.—1,885, H. Symons, Securing Slates to Roofs.—1,995, R. Hield, Hinges.—2,013, E. Nobbs, Flushing Water-closets, &c.—2,288, J. Bartlett, Ventilating Cowls.—2,362, H. Wilcox, White Lead, &c.—2,534, W. Parsey, Scaffolding.—2,740, F. Prescetto, Flushing Apparatus.—2,760, J. Nall, Dovetailing Machines.—2,819, J. Nicholls, Window Sash-holder.—2,945, W. Withington, Disinfecting Water-closets.—3,031, C. Anderson, Dry Closets.

COMPLETE SPECIFICATIONS ACCEPTED.

Open to Opposition for Two Months.

3,798, J. Stidder. Fitting Windows, &c.—7,153, W. Stock, Syphon Cisterns,—17,346, J. Haake, Colours for Distempering.—20,700, H. Lake, Flooring for Stables, &c.—21,210, A. Boult, Carving and Cutting Machines.—431, W. Perkins, Mitreing or Bevelling Machines for Woodworking.—1,666, B. Madler, Door Checks.—1,747, J. Bowles, Saws.—2,071, G. Blanks and another, Dry Press for Brick-making Machine.

SOME RECENT SALES OF PROPERTY:

ESTATE EXCHANGE REPORT.

MARCH 9.—By *E. E. Croucher & Co.:* 78, Lenthall-rd., Dalston, u.t. 46 yrs., g.r. 4*l.* 4s., r. 42*l.*, 380*l.*; 31, Charrington-st., Oakley-sq., u.t. 32 yrs., g.r. 5*l.* 5s., 465*l.* By *P. Hodson:* 52, Eleanor-rd., Hackney, u.t. 66 yrs., g.r. 5*l.*, 260*l.*; 48, Marquis-rd., Stroud Green, u.t. 87 yrs., g.r. 8*l.*, r. 44*l.*, 375*l.* By *Ventom, Bull, & Cooper:* 60 to 66 (even), Wellington-rd., Stoke Newington, u.t. 19½ yrs., g.r. 12*l.*, r. 117*l.*, 450*l.*

MARCH 10.—By *Ramsey & Co.:* 16, Yalding-rd., Bermondsey, u.t. 43 yrs., g.r. 4*l.*, 290*l.*; 22, Beatrice-rd., Southwark-pk-rd., u.t. 47 yrs., g.r. 5*l.*, 275*l.*—By *Rogers, Chapman & Co.:* 123, Alderney-st., Pimlico, u.t. 41 yrs., g.r. 9*l.*, 500*l.*—By *P. Matthews:* No. 112, Stamford-hill, u.t. 74 yrs., g.r. 16*l.*, 1,500*l.*; 9, Torront-rd., West-green, u.t. 94 yrs., g.r. 6*l.* 10s., 290*l.*—By *E. Robins & Hine:* Hartland-rd., Kentish-town, f.g.r. of 37*l.* 5s., u.t. 48 yrs., g.r. 4*l.* 10s., 610*l.*; f.g.r. of 16*l.*, Hawley-st., u.t. 40 yrs., g.r. 1*l.* 7s., 265*l.*; 73 and 75, Hartland-rd., u.t. 48 yrs., g.r. 4*l.* 10s., r. 72*l.* 16s., 420*l.*; 9 and 13, Hawley-st., u.t. 40 yrs., g.r. 1*l.* 7s., r. 74*l.*, 590*l.*; 80, Gloucester-rd., Regent's-pk., u.t. 62 yrs., g.r. 7*l.*, r. 42*l.*, 355*l.*

MARCH 11.—By *A. Watson:* 44, Balham-grove, Balham, u.t. 80 yrs., g.r. 9*l.*, r. 32*l.*, 350*l.*—By *A. A. Hollingsworth:* 94, Locksley-st., Mile End, u.t. 70 yrs., g.r. 4*l.*, r. 39*l.*, 310*l.*—By *G. A. Kendall:* 17, 19 and 21, Ricardo-st., Poplar, u.t. 38 yrs., g.r. 12*l.*, r. 48*l.* 10s., 120*l.*; Sampson-st. and New-rd., Plaistow, f.g.r. of 5*l.* and 6*l.*, with reversion in 92 yrs., 215*l.*—By *Charles & Tubbs:* "Salterne," Venner-rd., Sydenham, f., r. 38*l.*, 405*l.*; "Stoneycroft," f., 400*l.*; 1 to 4, Hope Villas, Green Lanes, f., 750*l.*; f.g.r. of 75*l.*, Broad Arrow-ct., City with reversion in 74 yrs., 1,875*l.*—By *Walton, Warton & Co.:* 2 & 3, Drummond-crescent, Euston-sq., u.t. 9 yrs. g.r. 21*l.*, r. 121*l.*, 210*l.*

MARCH 12.—By *C. C. & T. Moore:* 23 and 27, Gros venor-st., Stepney, c., r. 50*l.* 8s., 585*l.*; No. 292, Old Ford-rd., u.t. 62 yrs., g.r. 8*l.*, 370*l.*; 81, Morvill-st., Bow

u.t. 62 yrs., g.r. 4*l.* 4s., r. 28*l.* 12s., 175*l.*; 2, Ewing-st., Mile-end, u.t. 84 yrs., g.r. 5*l.* 5s., r. 36*l.* 8s., 235*l.*; 2 and 3, Ely-ter., u.t. 19 yrs., g.r. 2*l.* 4s., r. 46*l.* 16s., 215*l.*; 48, Richard-st., Commercial-rd., E. u.t. 9 yrs., g.r. 2*l.* 7s. 6d., 75*l.*—By *Newbon & Co.*: 21, 23, and 25, Blomfield-st., Dalston, f., 785*l.*; 25, Muriel-st., Barnsbury, u.t. 31 yrs., g.r. 5*l.* 5s., r. 30*l.*, 245*l.*; 105 and 107, Bentham-rd., Hackney, u.t. 56 yrs., g.r. 9*l.*, r. 56*l.*, 510*l.*—By *R. A. Enright*: 23, Valentine-rd., Hackney, u.t. 59 yrs., g.r. 5*l.* 5s., 410*l.*; 12 and 14, Brodia-rd., Stoke Newington, u.t. 84 yrs., g.r. 12*l.*, 530*l.*—By *R. Chadwick*: 64, Shirland-rd., Maida Vale, u.t. 72 yrs., g.r. 10*l.*, 440*l.*—By *E. Stimson*: 61, Gurney-st., Walworth, u.t. 51 yrs., g.r. 5*l.* 5s., r. 49*l.* 8s., 500*l.*; 5 and 6, Sutherland-st., u.t. 21 yrs., g.r. 12*l.*; r. 72*l.*, 325*l.*; 1 and 4 Union-ter., Newington, u.t. 52 yrs., g.r. 13*l.*, r. 70*l.* 4s., and g.r. of 10*l.*, u.t. 52 yrs., 380*l.*; 5, 67, and 69, Canonbury-rd., Islington, u.t. 27 yrs., g.r. 12*l.*, r. 130*l.*, 840*l.*; 16, Shaftesbury-rd., Hammersmith, u.t. 62 yrs., g.r. 2*l.*, 700*l.*; 1, Shaftesbury-rd., E., u.t. 62 yrs., g.r. 10s., r. 32*l.*, 350*l.*; L.g.r. of 25*l.*, Glebe-st., Chiswick, u.t., 77 yrs., 410*l.*; 113, 115, and 135, St. George's-rd., Southwark, u.t. 11 yrs., g.r. 20*l.* 7s. 3d., r. 150*l.*, 460*l.*—By *F. Hazell*: 309, Vauxhall Bridge-rd., Pimlico, u.t., 33 yrs., g.r. 10*l.*, 1,000*l.*; 77, Croxted-rd., Dulwich, u.t. 53 yrs., g.r. 5*l.*, r. 38*l.*, 370*l.*

MARCH 13.—By *J. Hibbard*: "The Cottage," Northhill, Highgate, c. 200*l.*

[Contractions used in these lists.—F.g.r. for freehold ground-rent; l.g.r. for leasehold ground-rent; i.g.r. for improved ground-rent; g.r. for ground-rent; r. for rent; f. for freehold; c. for copyhold; l. for leasehold; e.r. for estimated rental; u.t. for unexpired term; p.a. for per annum; yrs. for years; st. for street; rd. for road; sq. for square; pl. for place; ter. for terrace; cres. for crescent; yd. for yard, &c.]

PRICES CURRENT OF MATERIALS.

TIMBER.		
Greenheart, B.G. ton	6/10/0	7/15/0
Teak, E.I... load	8/10/0	14/0/0
Sequoia, U.S.ft.cu.	2/3	3/0
Ash, Canada load	2/10/0	4/5/0
Birch, do.	2/5/0	4/5/0
Elm, do.	3/10/0	4/15/0
Fir, Dantsic, &c.	2/0/0	3/15/0
Oak, do.	2/10/0	4/10/0
Canada.....	4/17/6	6/10/0
Pine, Canada red	2/10/0	3/10/0
Do, yellow	2/0/0	5/10/0
Lath, D'ntsic, fath	5/0/0	6/0/0
St. Petersburg	5/0/0	7/0/0
Deals, Finland, 2nd & 1st std 100	7/0/0	10/0/0
Do, 4th & 3rd..	7/0/0	8/0/0
Do. Riga	6/0/0	7/10/0
St. Petersburg, 1st yellow ..	9/0/0	14/0/0
Do, 2nd yellow	8/0/0	9/0/0
Do, white	6/10/0	10/0/0
Swedish	6/10/0	15/0/0
White Sea	8/0/0	16/10/0
Canada, Pine 1st	13/0/0	24/0/0
Do. do. 2nd....	9/0/0	15/10/0
Do. do. 3rd, &c.	6/10/0	10/0/0
Do. Spruce. 1st	8/10/0	10/10/0
Do. do. 3rd & 2nd.....	6/0/0	7/10/0
New Brunswick	5/0/0	7/0/0
Battens, all kinds	3/10/0	15/10/0
Flooring Boards, sq., 1 in. prep. 1st	0/10/0	0/14/0
Do. 2nd.....	0/9/0	0/10/6
Other qualities	0/5/0	0/7/6
Cedar, Cuba ..ft.	/4	/4½
Honduras, &c.	/4	/4½
Mahogany, Cuba.	/4½	/6½
St. Domingo, cargo av	/4¾	/6½
Mexican do. do	/4¾	/5½
Tobasco do. do	/5¾	/7
Honduras do..	/5¾	/6½
Box, Turkey ton	4/0/0	13/0/0
Rose, Rio.....	10/0/0	20/0/0
Bahia	9/0/0	18/0/0

TIMBER (*continued*).		
Satin, St. Domingo .....ft.	0/0/10	0/1/3
Porto Rico	0/0/9	0/1/6
Walnut, Italian..	0/0/3½	0/0/7
METALS.		
IRON—Bar, Welsh, in London..ton	6/5/0	6/15/0
Do. do. at works in Wales	5/15/0	6/5/0
Do. Staffordshire, in London	6/5/0	7/0/0
COPPER—British, cake and ingot	56/0/0	57/0/0
Best selected ..	59/0/0	60/0/0
Sheets, strong..	66/0/0	0/0/0
Chili, bars	52/10/0	0/0/0
YELLOW METAL lb.	0/0/6	0/0/6½
LEAD—Pig, Spanish....ton	12/8/9	0/0/0
English, com. brands	12/10/0	0/0/0
Sheet, English, 3 lbs. per sq. ft. and upwards ..	14/5/0	0/0/0
Pipe	14/15/0	0/0/0
ZINC—English sheet .....ton	27/3/0	0/0/0
Vieille Montagne.....	27/3/0	0/0/0
TIN—Straits	90/10/0	0/0/0
Australian	90/15/0	0/0/0
English Ingots	94/10/0	0/0/0
OILS.		
Linseed .....ton	22/10/0	22/15/0
Cocoanut, Cochin	35/10/0	36/0/0
Do. Ceylon	28/10/0	0/0/0
Palm, Lagos	25/0/0	25/10/0
Rapeseed, English pale	29/15/0	30/0/0
Do. brown	28/5/0	0/0/0
Cottonseed ref...	20/10/0	0/0/0
Oleine	21/15/0	24/0/0
Lubricating, U.S.	6/0/0	7/0/0
Do. refined	7/10/0	12/0/0
TAR—Stockholm barrel	1/1/6	1/2/0
Archangel	0/14/6	0/0/0

TENDERS.

***Next week communications for insertion under this heading must reach us *not later than* 12 *noon on Wednesday*, as we go to press a day earlier than usual.

BLAENGARW (Glamorganshire).—For additional accommodation for 283 children at Blaengarw Schools, for the Llangeinor School Board. Mr. George F. Lambert, Architect, Town-hall, Bridgend. Quantities by the architect:—

J. Rees	£2,700	Evans Matthews	£2,193
E. Preece	2,495	J. D. Williams	1,899
D. Llewllyn	2,450	D. C. Jones & Co., Gloucester (accepted)	1,794
J. Roberts	2,420		

[Architect's estimate, £2,380.]

BRAYBROOK (Northants).—For the reparation of All Saints' Church, Braybrook. Messrs. John Giles, Gough, & Trollope, architects, 28, Craven-street, W.C.:—

Willcock	£1,085 15 0	E. Brown & Son	£962 0 0
Foster & Dicksee	1,075 0 0	Claridge & Bloxham	855 0 0
Fred Barlow	1,047 0 0		

BRENTFORD.—For erecting isolation hospital, administrative cottage, mortuary, boundary wall, &c., at Clayponds-lane, Brentford, for the Brentford Local Board. Mr. J. H. Strachan, Surveyor:—

A. Kellett	£4,955 4 6	H. J. Heywood	£3,763 0 0
F. Orfeur	4,273 0 0	Thos. Turner, Ld. ..	3,687 0 0
W. Brass & Son	3,977 0 0	Flew & Co.	3,674 0 0
H. Smith	3,890 0 0	W. Nye	3,632 0 0
J. H. Jarvis	3,875 0 0	Allen & Sons, Kilburn*	3,630 0 0
Lansdown & Co.	3,857 0 0	R. G. Batley	3,574 0 0

* Accepted.

CADOXTON (South Wales).—For building a steam laundry at Cadoxton, for the Barry Dock Sanitary Steam Laundry Company, Limited. Messrs. Bruton & Williams, architects, Cardiff:—

David Davies	£1,625 0 0	Lawrence, Perryman & Waller	£1,389 10 0
John Jones	1,450 0 0	E. J. Ince	1,290 0 0
Sydenham & Pearce	1,434 12 0	W. Crisp	1,195 0 0

CAERPHILLY.—For re-instating (after damage by fire) of villa residence known as "The Mount," Caerphilly. Messrs. Bruton & Williams, architects, Cardiff:—

William Cox	£825 0 0	E. Hedges	£625 0 0
Lawrence, Perryman, & Waller	773 0 0	Frederick Kastell	605 10 0
Williams & Thomas ..	689 12 0	Frederick Darke	525 0 0

CARSHALTON.—For erecting house in Ringstead-road, Carshalton, for Mr. Wm. Smith. Mr. Geo. Jackson, architect and surveyor, Charing-cross:—

Shillitoe & Son	£2,450	Kelland (accepted)	£2,150
Holloway Bros.	2,300	Johnson	2,140
Chateris	2,238		

CHELMSFORD.—For erecting five small houses. Mr. Rd. Mawhood, architect, Chelmsford:—

T. Goldfinch, Whitstable (accepted)	£1,125 0 0

CLACTON-ON-SEA.—For the erection of a villa residence in St. Paul's-road, Clacton-on-Sea, Essex (exclusive of stoves and chimney-pieces, bath, and fences), for Mr. Horace R. Spence. Mr. G. Warren Cooper, architect, Bedford-row House, Bedford-row, W.C. No quantities supplied:—

Wallace Sargeant	£906	Henry Everett & Son, Colchester (accepted)	£715
Stephen Goodall	742	Norman De Maid	700

CLACTON-ON-SEA.—For the erection of a villa residence in St. Paul's-road, Clacton-on-Sea (exclusive of stoves and chimney-pieces, bath, and fences), for Mr. James G. White. Mr. G. Warren Cooper, architect, Bedford-row House, Bedford-row, W.C. No quantities supplied:—

Wallace Sargeant	£750	Norman De Maid	£575
Stephen Goodall	690	Henry Everett & Son*	570

* Accepted.

CLACTON-ON-SEA.—For the erection of a villa residence in St. Paul's-road, Clacton-on-Sea (exclusive of stoves and chimney-pieces, bath, and fences), for Mr. Walter Young. Mr. G. Warren Cooper, architect, Bedford-row House, Bedford-row, W.C. No quantities supplied:—

Wallace Sargeant	£781	Norman De Maid	£640
Stephen Goodall	724	Henry Everett & Son*	590

*Accepted.

CROYDON.—For alterations to No. 19, High-street, Croydon, for Messrs. Grant Brothers. Mr. Alfred Broad, architect, 27, Dingwall-road, Croydon:—

Down	£283 15	Leigh & Funnell	£194 0
Bulled	239 0	Saunders*	185 0
Barker	214 0		

* Accepted.

[All of Croydon.]

EDGWARE.—For the erection of a new Police-station at Edgware, for the Receiver for the Metropolitan Police District. Mr. John Butler, architect, New Scotland-yard. Quantities by Mr. W. H. Thurgood:—

	Credit.
Patman & Fotheringham	£1,892 —
Scrivener & Co.	1,797 —
Grover & Son	1,770 —
C. Ansell	1,777 £20
Lathey Bros.	1,743 10
Willmott & Sons	1,688 10

GREAT STANMORE.—For the erection of a pair of cottages on the estate for Mr. Frederick Gordon. Messrs. Young & Spencer, architects, 17, Coleman-street, E.C.:—

Messrs. Kirby & Sons, Stanmore (accepted)	£614 0 0

HALIFAX.—Accepted for the erection of fourteen dwelling-houses at Holywell Green. Messrs. C. F. L. Horsfall & Son, architects, Lord-street-chambers, Halifax. Quantities by the architects:—

Masons—Edward & Akroyd, Stainland	£1,260 14 0
Joiner—J. Cookson, Stainland	530 0 0
Plumber—J. Stafford, Sowerby Bridge	119 18 0
Plasterer and Slater—T. Collins, Towood, Huddersfield	236 0 0
Painter—G. U. Longbottom & Son, Halifax	50 0 0
Fixtures—G. Greenwood & Sons, Halifax	73 0 0

HARROW-ON-THE-HILL.—For stabling at Mountside, Harrow, for Mr. R. T. Hargreaves. Mr. F. N. Cowell, architect and surveyor, Harrow:—

Arthur Dashwood & Sons	£610 5 2
Alfred Webb	585 0 0
W. B. Walker, Harrow (accepted)	570 0 0

HIGHGATE.—For erecting foreman's cottage at Highgate Depôt, for the Hornsey Local Board. Mr. T. de Courcy Meade, Engineer and Surveyor:—

E. Kerry & Son	£720 0 0	William Wells	£605 0 0
Chessum & Sons	646 0 0	Willmott & Sons, Hitchin*	545 0 0
B. Cooke & Co.	640 9 3		
F. Voller	633 19 0		

* Accepted.

HORNSEY.—For erecting new ward block at the Isolation Hospital, for the Hornsey Local Board. Mr. T. de Courcy Meade, Engineer and Surveyor:—

E. Kerry & Son	£1,600 0 0	Chessum & Sons	£1,327 0 0
John Allen & Sons ..	1,501 0 0	Willmott & Sons, Hitchin*	1,314 0 0
William Wells	1,466 0 0	J. O. Richardson ..	1,279 0 0
F. Voller	1,426 8 0		
B. Cooke & Co	1,403 0 0		

* Accepted.

HORNSEY.—For new sewers, Muswell-hill-road to Archway-road, for the Hornsey Local Board. Mr. T. de Courcy Meade, Engineer and Surveyor:—

Thomas Adams	£6,494 2 3	George Bell	£4,630 0 0
J. Bloomfield	5,850 0 0	B. Cooke & Co., Battersea*	4,314 0 0
T. G. Dunmore	5,816 0 0		

* Accepted.

HORNSEY.—Accepted for making-up of private roads, for the Hornsey Local Board. Mr. T. de Courcy Meade, Engineer and Surveyor:—

Clifton-road.—Cooke & Co., Church-road, Battersea	£1,283 15 2
Avenue-road.—Jas. Bloomfield, Tottenham	3,544 0 0
Wightman-road.—Griffiths, Lewis, & Co., Millwall	1,330 13 0
Addington-road.—A. Walker, Holloway	705 0 0
Denmark-road.—A. Walker, Holloway	640 0 0
Umfreville-road.—A. Walker, Holloway	725 0 0

HORNSEY.—Accepted, on schedule of prices, for the supply of materials and labour as hereunder stated, for the Hornsey Local Board. Mr. T. de Courcy Meade, Engineer and Surveyor:—

Paving, Granite, and General Masons' Materials.
W. Griffiths, Kingsland-road.

Broken Granite and other Road Materials.
W. Griffiths, Kingsland-road (for broken granite).
Wm. Walker, Holloway (for other road materials).

Sewer Jobbing Work.
T. G. Dunmore, Crouch End.

LEEDS.—Accepted for the erection of a mission-room, class-room, caretaker's house, &c., Church-street, Hunslet. Mr. Geo. F. Danby, architect, 46, Great George-street, Leeds:—

Builder—B. Hutchinson, Elland-road, Leeds..	£640 0 0
Joiner—Joseph James, Hunslet, Leeds	376 0 0
Slater—J. W. Richmond, Hunslet, Leeds	53 0 0
Plumber—J. Cockerill, Hunslet, Leeds	114 0 0
Plasterer—W. Pennington, Woodhouse, Leeds	44 0 0
Painter—Alf. Welham, Leeds	24 0 0
Total	£1,251 0 0

LEEK.—For sewering, levelling, forming, paving, &c., of Brunswick-street, for the Commissioners. Mr. J. Myatt, Town Surveyor:—

	Tegsnose Stone.	Kerridge Stone.
J. W. Critchlow, Leek	£405 5 11 ..	£391 12 9
T. Grace, Leek	375 0 0 ..	—
F. Barke, Stoke on Trent*	326 7 5 ..	—
Williamson & Son, Macclesfield	— ..	320 0 0

* Accepted.

LOCH AWE (Argyllshire).—Accepted for additions to the hotel at Loch Awe, Argyllshire, for Mr. Duncan Fraser. Mr. John Young, architect, Perth:—

Mason and Iron Works—Fraser & Morton, Perth	£3,140 19 11
Carpenter, Joiner, and Glazier Works—James Hay & Son, Perth	1,934 15 2
Plumber Work—James McLeish, Perth	716 13 0
Plaster Work—Alexander McRitchie, Dundee	417 13 8
Slater Work—James Buchan, Perth	107 0 0
Bells and Lift—Westwood & Sons, Perth	75 2 6

LONDON.—For the erection of a Free Public Library, White chapel. Messrs. Potts, Sulman, & Hennings, architects, 1, Furnival's Inn, E.C. Quantities by Mr. Geo. Fleetwood, 15, Furnival's Inn, E.C.:—

		Extra for Fireproof Floor.
J. Catley	£7,450	.... —
J. Morter	7,300	.... —
W. Brass & Son	7,243	.... £270
W. Shurmur	7,188	.... —
Willmott & Sons	7,076	 262
A. Eaton & Co.	6,909	 390
Holloway Bros.	6,840	 233
Ashby & Horner	6,825	 259
Scrivener & Co.	6,790	 275
T. Little	6,777	 252
M. Gentry	6,650	 280
J. R. Hunt	6,528	 272
Perry & Co.	6,525	 211
Coulsell Bros.	6,524	 318
Richardson Bros.	6,450	 280
F. & F. J. Wood	6,429	 257
Harris & Wardrop	6,423	 299
J. Allen & Sons	6,344	 250
Chessum & Sons	6,225	 267
W. Gladding (accepted)	6,179	 275

LONDON.—For making-up the carriage-way of Melgund-road and Witherington-road, Highbury, for the Vestry of Saint Mary, Islington. Mr. J. Patten Barber, C.E., chief surveyor:—

	Melgund-road.	Witherington-road.
Rutty & Son	£365	£467
George Bell	328	393
Wilkinson Bros.	325	422
James Pizzey	320	415
William Griffiths	305	361
Thomas Adams	298	368
Aspinall & Son	293	345
Wall Bros	292	319
Charles Taylor	289	340
F. A. Jackson & Son, Upper Holloway, N.	282	313*
W. Walker, Upper Holloway, N.	279*	316

* Accepted.

LONDON.—For restoration after fire to premises, 121, Queen Victoria-street. Mr. J. E. Saunders, architect:—

Ryder	£3,258	Lascelles	£2,863
Colls	2,998	Brass	2,752
Grover	2,907	Smith	2,748
Woodward	2,988	B. E. Nightingale	2,639
Shepherd	2,886		

LONDON.—For the erection of new factory, Love-lane, Southwark, for Sir Joseph Causton & Sons. Messrs. Young & Spencer, architects, 17, Coleman-street, E.C.:—

Cook & Coney (accepted)	£15,500 0 0

LONDON.—For pulling down and rebuilding Nos. 54 and 55, Piccadilly, W., for Messrs. Hobson Bros. Messrs. Young & Spencer, architects, 17, Coleman-street, E.C. Quantities by Messrs. Gardiner, Son, & Theobalds, 110, Great Russell-street, W.C.:—

John Grover & Sons	£5,388	G. H. & A. Bywaters	£5,132
J. & W. Pattinson	5,224	J. Woodward & Co.*	4,900

* Accepted.

LONDON.—For additions and alterations to premises, Clarke's-place, Bishopsgate-street, for the Marine Society. Messrs. T. Chatfeild Clarke & Son, architects:—

Ashby & Horner	£3,811	Cox	£2,875
Hall, Bedall, & Co.	2,980	B. E. Nightingale	2,855
Colls	2,904	Woodward & Co.	2,800
Ryder	2,896	Brown, Son & Blomfield ..	2,790
Ashby Bros.	2,882	Lawrence & Sons	2,752

LONDON.—For alterations, &c., to 48, Greek-street, Soho. Mr. F. W. Ledger, architect:—

H. Childs & Sons	£719	Gainham & Son	£492
Woodward & Co.	645	B. E. Nightingale	470
Greenwood & Son	541		

LONDON.—For restoration after fire to premises, 45, Clapham Park-road. Mr. Turk Lacey, architect:—

Hollingsworth	£248	Higgs	£235
B. E. Nightingale	239		

LONDON.—For alterations and repairs to the "Offord Arms," Caledonian-road, N. Messrs. Eedle & Mayers, architects:—

B. E. Nightingale	£2,965	Smith	£2,550
Ryder	2,878	Avis	2,488
Toms	2,809	Spencer & Co.	2,420
G. Colls	2,650		

LONDON.—For the erection and completion of superstructure of factories, Baldwin's-gardens, Gray's Inn-road. Mr. W. Graves, architect:—

Holland & Hannen	£3,127	Wall & Co.	£2,744
Brass & Son	2,968	Harris & Wardrop	2,733
Grover & Son	2,796	Lawrence & Sons	2,716
B. E. Nightingale	2,781		

LONDON.—For alterations to the "Prince's Head" public-house, York-road, Battersea, for Mr. J. J. Calder. Mr. W. Seckham Withington, architect, 79, Mark-lane, E.C.:—

Kilby & Gayford	£839	Drew & Cadman	£704
Kearley	824	Little & Senecal (accepted)..	681

LONDON.—For dilapidations and decorating, 31, Pembroke-gardens, Earl's Court, S.W., for Mr. T. Parker. Mr. H. J. Newton, architect, 49, Victoria-street, Westminster, S.W.:—

C. Kearley	£388	J. Barker & Co.	£347
C. Dearing & Son	361	Leslie & Co., Kensington-square (accepted)	340
F. Mark	354		

LONDON.—For pewterers' work at the "Daniel Lambert" Hotel, Ludgate-hill, E.C., for Mr. R. H. Barnes. Mr. H. J. Newton, architect, 49, Victoria-street, Westminster, S.W.:—

Watts & Co.	£297 17	Sanders & Sons, High Holborn*	£147 10
T. Heath	191 0		
W. Helling	177 0		

* Accepted.

LONDON.—For alterations and additions to factory at rear of 505, Old Kent-road, for Mr. G. W. Miller, 132, New Kent-road, S.E.:—

Larkin	£150	A. & W. Garnar, Peckham*	£145

* Accepted.

LONDON.—For alterations, &c., to 11, Hill-street, Berkeley-square, for the Duke of Newcastle. Mr. Charles Bell, architect, 3, Salters' Hall-court, Cannon-street:—

Kent	£230	Hatfield*	£180
Chas. Wall	185		

* Accepted.

LONGTOWN (Cumberland).—For building two bridges of 50 ft. span each, at Breakings, Stapleton, for the Highway Board. Mr. Richard Maxwell, surveyor, Longtown:—

Thos. Telford, Langholm, N.B. (accepted)	£1,235 0 0

MORLEY.—For laying cast-iron water-pipes, erection of bridges, &c., in connexion with the Morley Waterworks, for the Corporation. Mr. Charles Gott, Engineer, 8, Charles-street, Bradford:—

A. Broxup & Son ..	£17,458 0 0	J. Schofield, Sons, & Co.	£8,508 16 10
Parkinson & Bower	16,510 0 0		
Slinger & Naylor	15,736 0 0	Matthew Hall	8,370 19 5
E. Kellett	13,420 0 0	David Barry, Radcliffe-on-Trent, near Nottingham*	8,022 10 0
H. Vickers	11,543 0 0		
J. & T. Young	10,284 13 2		
H. Fotherby & Son	9,397 1 5		

*Accepted.

[In our issue of the 7th inst. the list of tenders received for the *Supply* of the cast-iron pipes was headed by mistake for *Laying* the pipes.]

WITHINGTON (Lancs.).—For the sewering, paving, flagging, &c., of York-street, Albany-road; No. 1 Passage, Hope-street; No. 3 Passage, Albany-road; and No. 2, 4, and 6 Passage, Keppel-road, Withington, for the Withington Local Board:—

	York-street.	Albany-road.	No. 1 Passage, Hope-street.	No. 3 Passage, Albany-road.	No. 2 Passage, Keppel-road.	No. 4 Passage, Keppel-road.	No. 6 Passage, Keppel-road.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Matthew Naylor, 54, Mytton-street, Hulme, Manchester	346 13 8*	1,074 2 3	14 8 9*	39 3 7*	17 8 8*	17 8 8*	35 2 9*
William Hammett, Ashton-on-Mersey, Cheshire	350 14 3	1,115 6 8	17 16 6	43 17 11	19 10 7	19 10 7	39 6 0
W. Snape & Sons, Eccles	356 11 4	1,152 11 5	18 15 6	40 1 2	17 16 4	17 16 4	35 18 6
George Clarke, Bristol-street, Hulme, Manchester	361 17 2	994 13 8*	17 10 0	41 4 4	18 5 8	18 5 8	36 18 0
Worthington & Pownall, Rusholme-road, Manchester	384 0 11	1,200 8 2	17 17 3	43 12 0	19 8 0	19 8 0	39 0 9
William Clarke, Dearden-street, Hulme, Manchester	385 10 7	1,105 10 8	18 9 9	43 8 5	19 2 10	19 2 10	38 18 9
W. H. Ibberson, Cheetham-hill, Manchester	410 0 0	1,125 0 0	16 12 0	43 10 0	—	56 0 0	—

* Accepted

NEWMARKET.—For the erection of house and offices, for Mr. J. Watts. Messrs. Roberts & Gordon, architects, Welford-place, Leicester:—
Enoch Hind, Nottingham (accepted) £4,968 0 0

NORTHAMPTON.—For the erection of a house and premises, at Cogenhoe, for Mr. W. A. Mann. Messrs. H. H. Dyer & Son, architects, Newland Chambers, Northampton:—

Adnitt & Everard	£1,183	J. T. Wingrove	£1,072
G. Henson	1,150	Woodford & Son	1,070
Green Bros.	1,150	J. C. Sharman	1,012
A. P. Hawtin	1,130	Clayson Bros.	995
G. J. Fisher	1,125	G. White, Northampton*	992
E. Archer	1,085	* Accepted.	

PORTADOWN (Ireland).—For building a new chimney at the gasworks, for the Gaslight Company:—

R. M. Beattie	£200 0	Bright Bros., Portadown*	162 10
Richard Sutton	£195 0	* Accepted.	

PORTISHEAD.—For the erection of house and shop at Portishead, near Bristol, for Mr. E. F. Frowd. Messrs. Hunt & Young, architects:—

Green	£830	Thomas, Portishead*	£663
Biss	681	* Accepted.	

RUNCORN.—For the erection of a new Institute, for the Mersey Mission to Seamen. Mr. John Wilson, architect, Greenway-road, Runcorn:—

W. Farrell & Son	£1,050	Henry Coward, Runcorn*	£1,045
Wilson & Sefton	1,050	* Accepted.	

SHEFFIELD.—For the erection of new Municipal Buildings, for the Corporation. Mr. Edwd. W. Mountford, architect, 17, Buckingham-street, Strand, W.C. Quantities by Mr. E. C. Pinks, 45, Parliament-street:—

	Cowbench stone for exterior.	Stoke Hall stone for exterior.	Huddersfield stone for exterior.
Graham & Son	£92,622	£90,372	£82,172
Nicholson & Son	90,593	91,614	92,124
Reed, Blight, & Co.	89,748	90,718	91,039
Lowe & Sons	89,739	93,069	94,639
Rudd & Son	88,500	89,750	92,100
Henry Lovatt	86,441	89,741	90,941
Armitage & Hodgson	84,665	87,048	87,048
John Bowen	82,997	85,497	87,547
Edmund Gabbutt, Liverpool	81,945	83,945*	87,945
Shillitoe & Son	81,750	84,750	89,750

* Accepted.

STRATFORD.—For erecting new factory and warehouse at Sugar House lane, Stratford, E., for Messrs. Usher & Co.:—

Gould & Brand	£783	H. M. Dove, Watford*	£675
W. H. Lascelles & Co.	698	* Accepted.	

TOTTENHAM.—For constructing a cellar under the "Black Boy" Hotel, for Mr. C. W. Tame. Messrs. Hodson & Whitehead, architects, 7, Finsbury-square, E.C.:—
M. A. Brown & Co., Belmont-road, West Green (accepted) £253 0 0

WEST GREEN.—For the erection of seven houses on the Woodlands Park Estate, West Green, for Messrs. Hodson & Elphicks:—

Chas. Daing	£3,150	E. Houghton & Son	£2,648
Chessum	2,973	Payne & Son	2,525
Pierce & Co.	2,738	Percy Hart	2,290

WILLESDEN.—For the erection of a hall at Willesden. Mr. C. Bell, architect, 3, Salters'-hall-court, Cannon-street:—

Batchelor	£4,335	Dearing & Son	£3,997
Dove Bros.	4,325	Mills	3,990
Grover & Son	4,280	Allen	3,887
Scrivener	4,124	Baalam	3,527
Anley	4,120		

WRITTLE (Essex).—For erecting twelve cottages. Mr. Rd. Mawhood, architect, Chelmsford:—
W. Baker, Danbury (accepted) £1,320 0 0

Escape Staircases at St. John's Hill, Infirmary.—Messrs. B. C. Badham & Co., of Featherstone-buildings, Holborn, ask us to say that they tendered for these at £1,677, and that their name should be substituted for the name "Baker," which was a mistake. The mistake was not ours.

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All statements of facts, lists of tenders, &c. must be accompanied by the name and address of the sender, not necessarily for publication.

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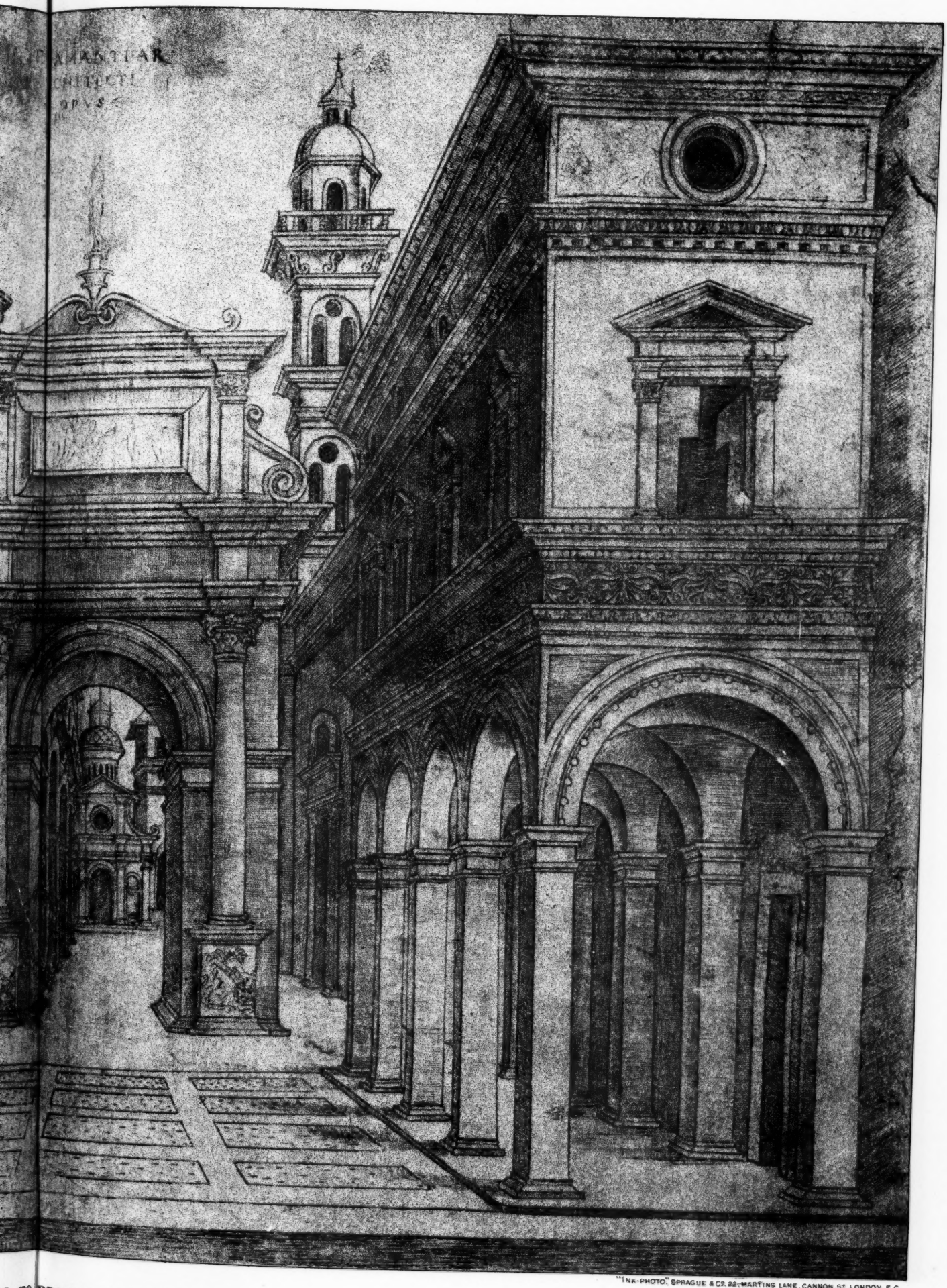

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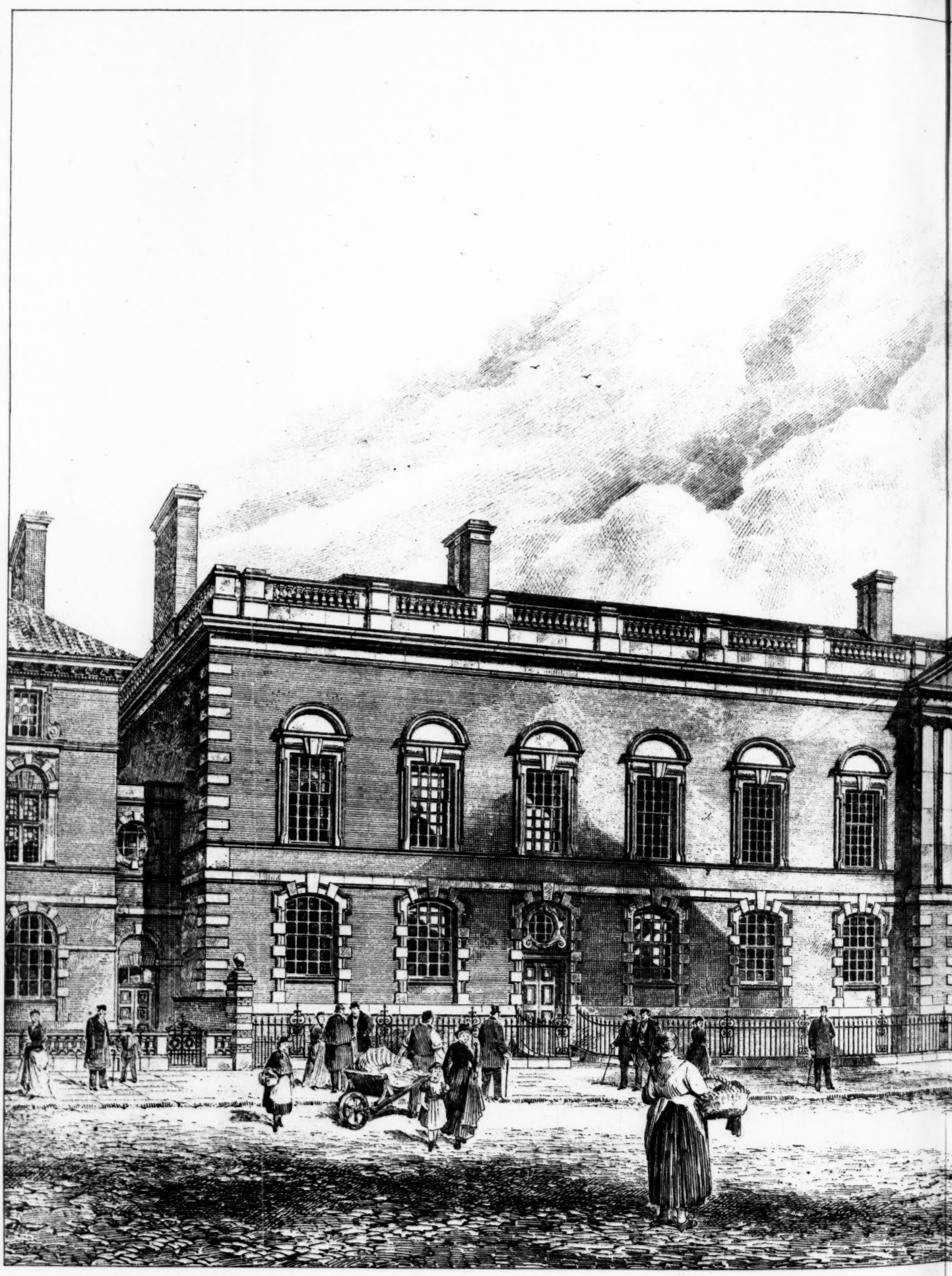

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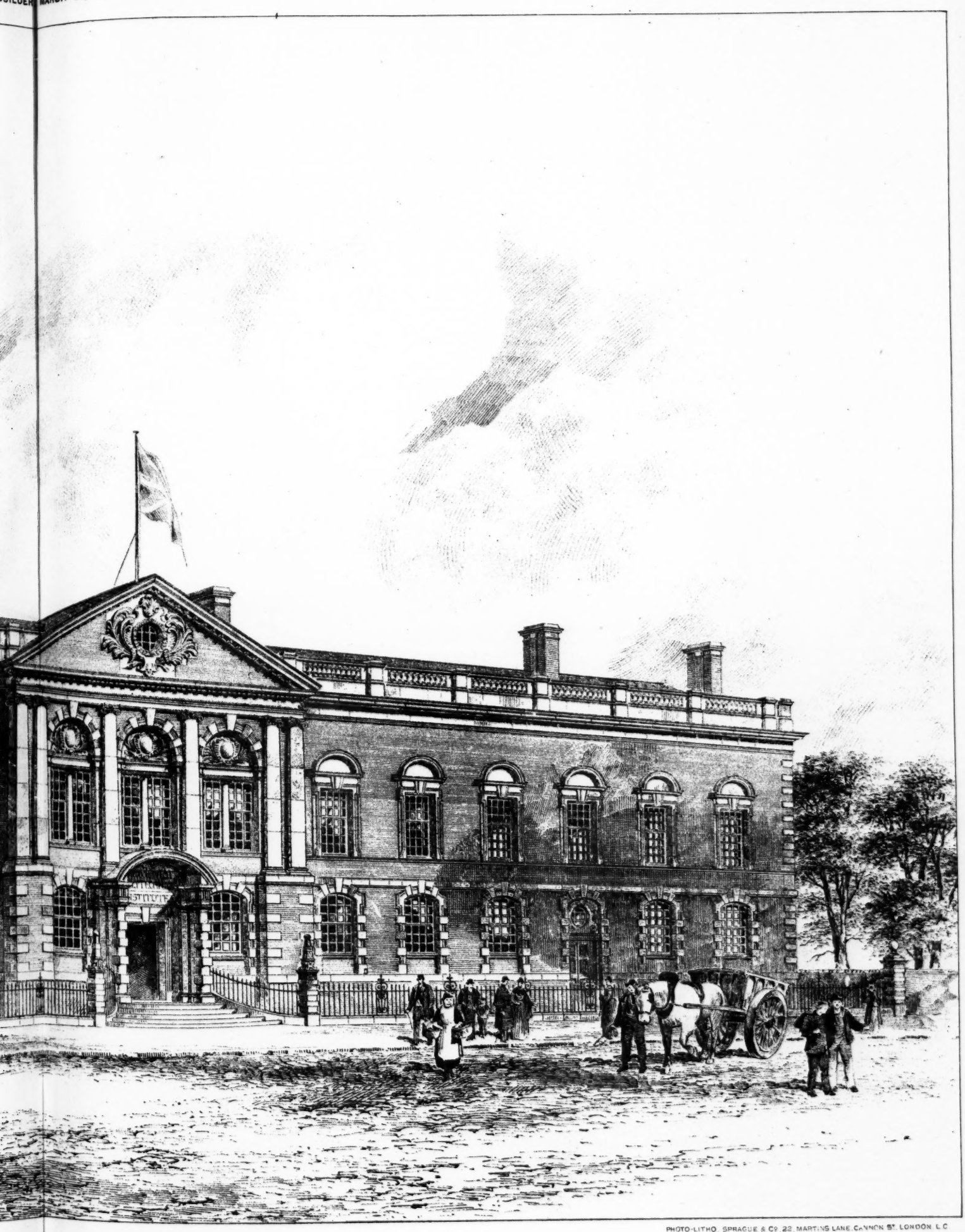

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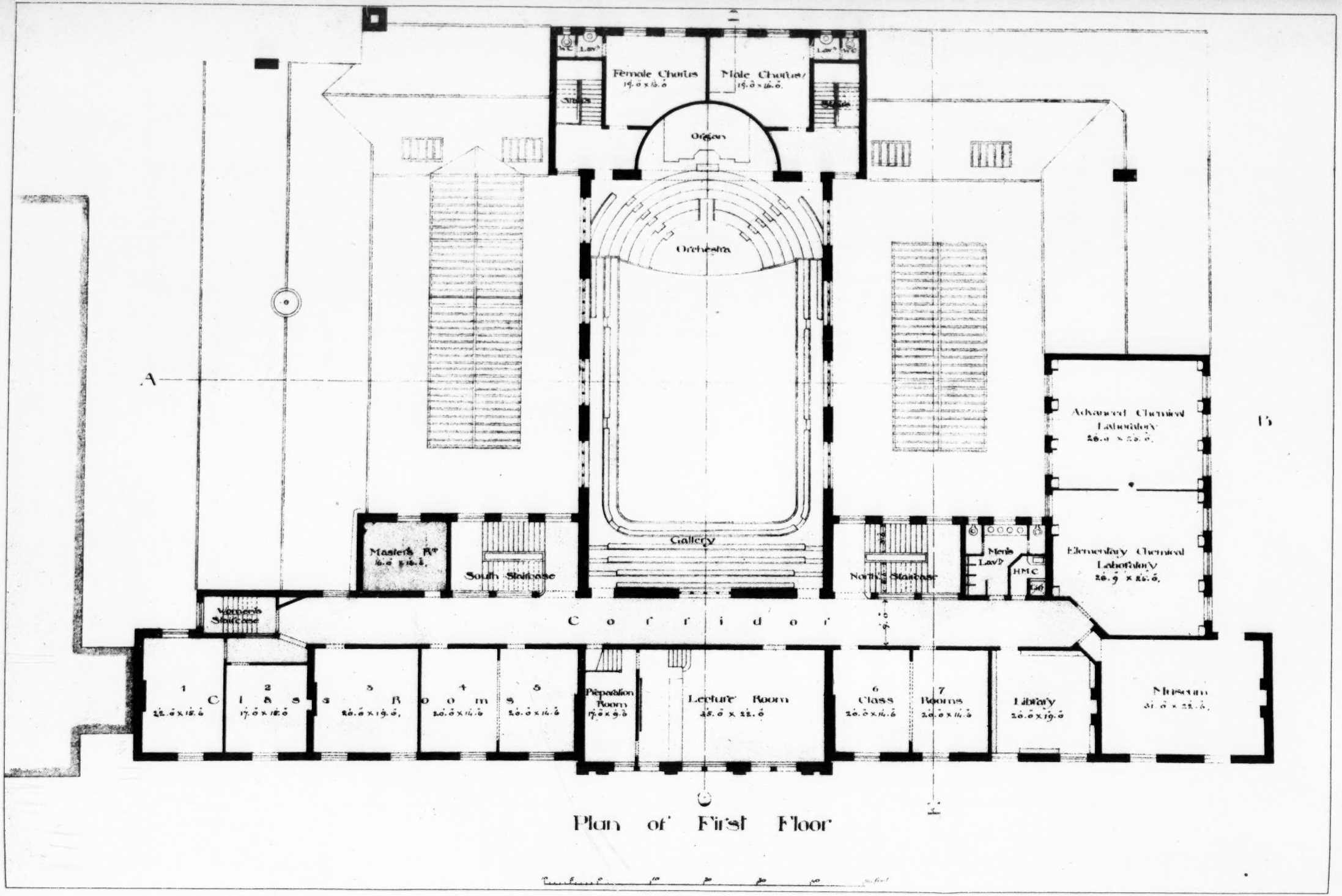
VIEW OF FRONT TO MANRESA ROAD.



Plan of First Floor

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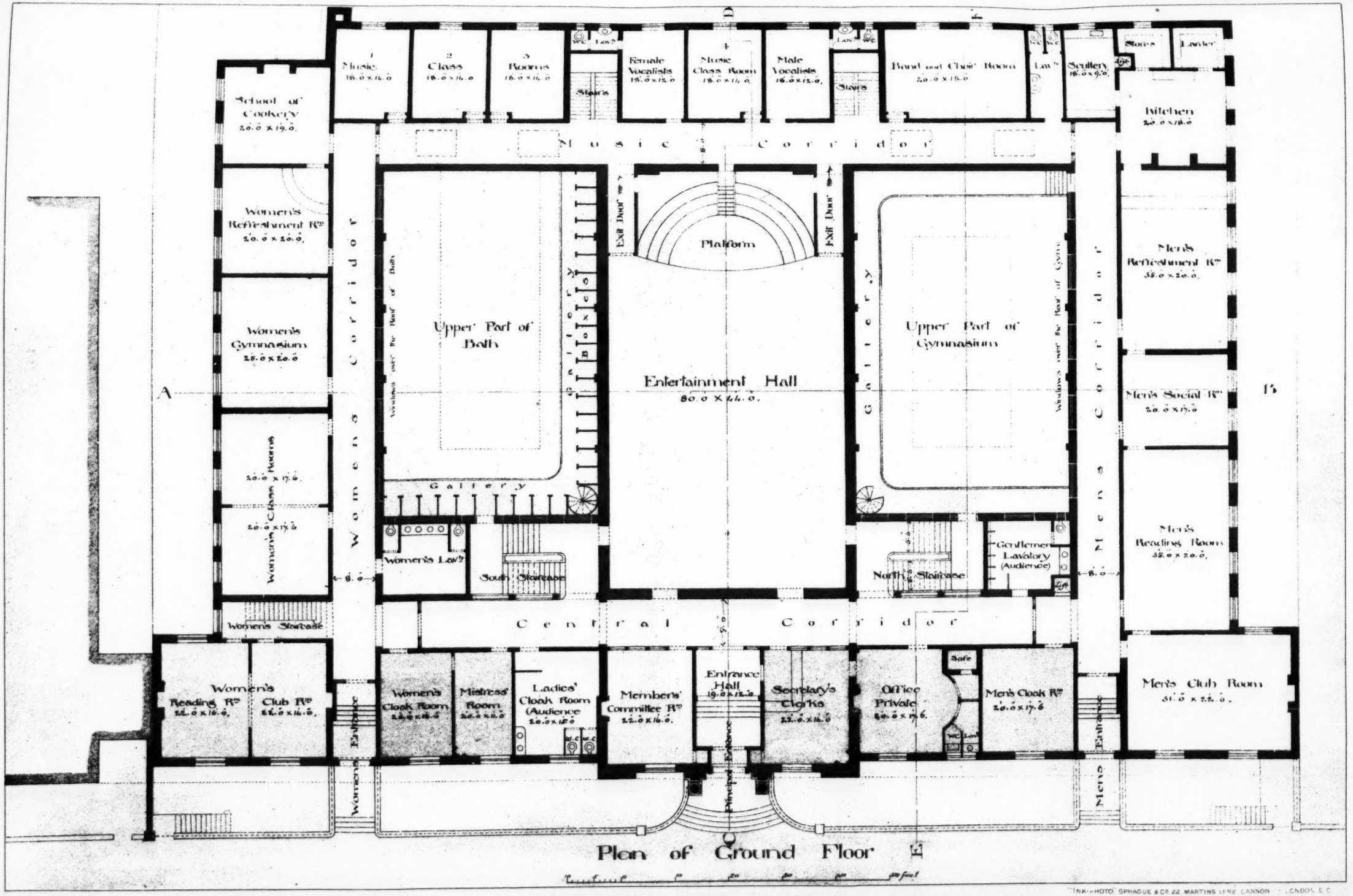

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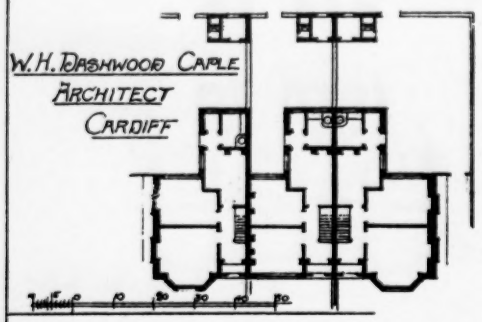
THREE VILLAS AT DYNAS POWIS NR. CARDIFF.



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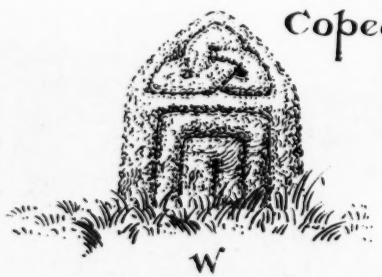

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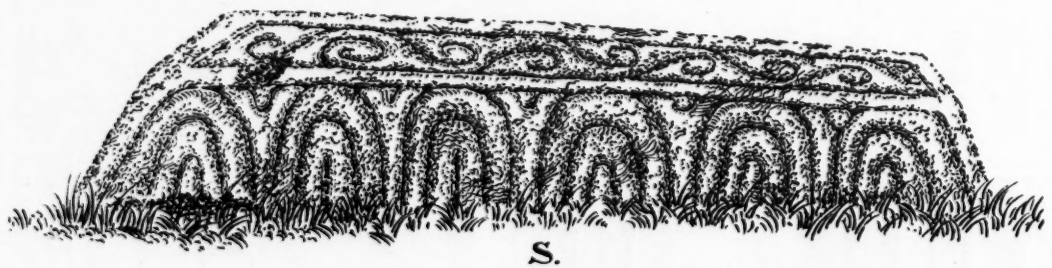

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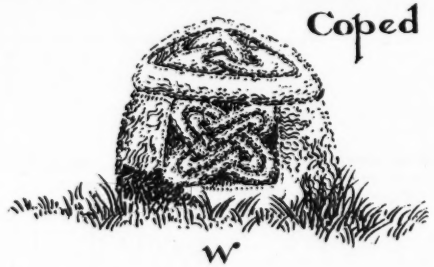
Coped stone Lanivet.



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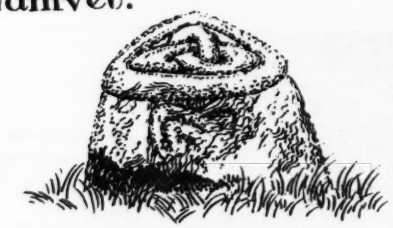

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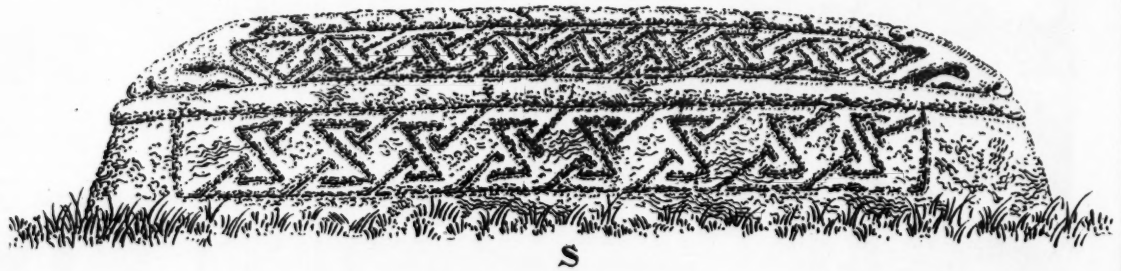

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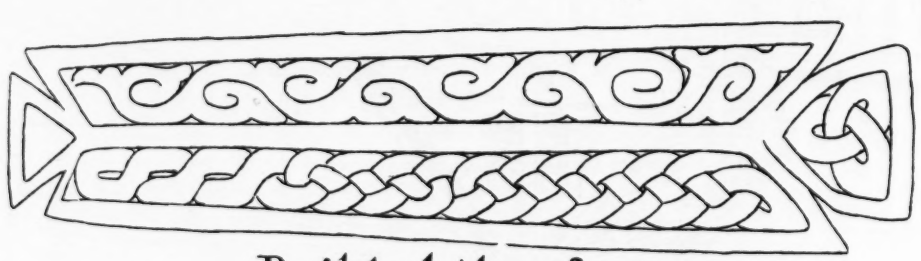

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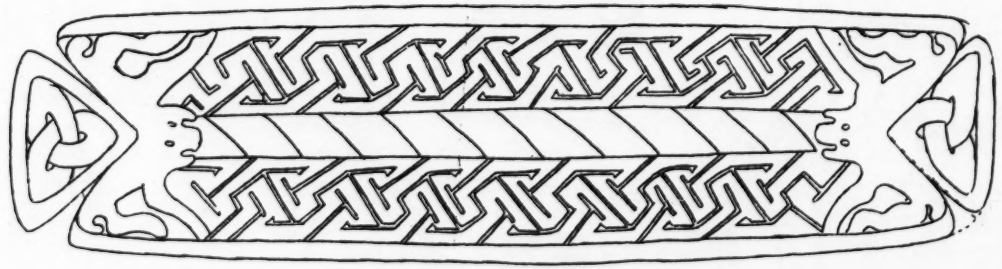

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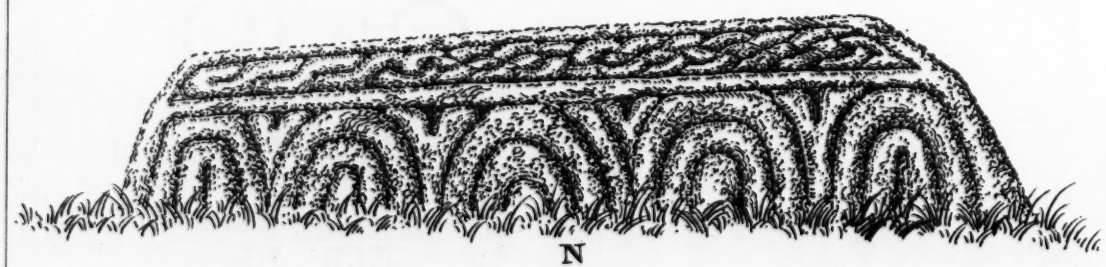

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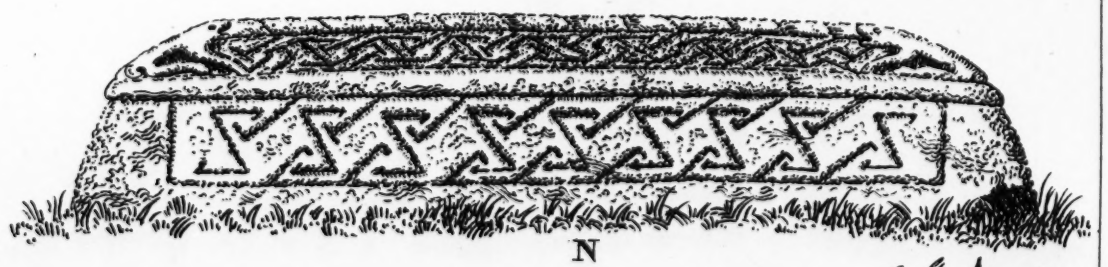

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A. G. Langdon
3 May 1889

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